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1914.

A Retrospect.

WITHIN numbered hours, amid the clash of arms, the boom of heavy cannon, the crack of guns, the grim struggles of humanity, and all the tragedy arising from war, the last night will close upon the year 1914. What a year it has been! The most terrible of any page of those constituting the prior history of the world pales in incidents before the tragic ones which have been developed, are developing, and have still to be developed, in the making of fresh history. The year opened brightly enough; hopes ran high that it would be a year better than the one preceding. There came domestic troubles—in Ireland and elsewhere—which were accounted grave; there came labour troubles in South Africa and in our own midst; there came difficulties in Mexico and Brazil. But all these things are now mere shadows among the events of the year. They have faded into insignificance beside the happenings that broke upon the world in middle summer. The cloud between Serbia and Austria that rose upon the horizon was no bigger than a man's hand. A tragic event, true, was the beginning. But the immediately subsequent eruption, in the opinion of experienced diplomacy, was not beyond peaceful arbitrament and solution. It was, however, adjudged to be the opportunity of ambition—the ambition of Germany to be supreme in the world; and that country, its Government, its militarism, its thirty years' methodical preparation for war, were all quickly exposed in true and strong light to an astonished world. There was no arbitrament, other than that of the sword. Bitter, egotistical, and stubborn resolution governed. Dishonour crowned the development of events. The ruthless violation was seen of a nation's sworn word to observe the neutrality of a small, brave kingdom, to the people of which honour was as dear as country. Great Britain, honour-bound, and with its eyes opened as to its own future in certain untoward events—honest attempts at mediation having failed—had no two courses open to it. It had to enter upon war, allied with those countries to whom the integrity of the rights of nations, the maintenance of peace, and the defence of freedom and civilization, stood for more than a national ambition, sought to be attained by military might and the devastating instruments of war. August 4 was the epoch-marking day in the history of this country; for it was the day that Great Britain declared war upon Germany (later Germany's ally Austria), and linked her fortunes with those of France, Russia, Belgium, and Serbia. Turkey was also brought, by German intrigue and pressure, into the international maelstrom. However, it is a long tale, big with detail, too much—and it would be out of place—for telling in these pages. In it, however, one of the proudest things for Great Britain, next to that of the position taken in defence of its national honour, was the spirit of unity that, on the declaration of war, at once strung together as one the whole British Empire in support of the defence of its honour and the ensuring of its future safety and peace. Canada, Australia, New Zealand, India, and the Cape came promptly to the assistance of the Motherland, with sons and substance. It was all a remarkable demonstration of a deeply rooted Imperial oneness.

THE GAS INDUSTRY AND THE WAR.

Life and property have undergone, and are undergoing, devastation; national substance has been, and is being, expended. But it is all being faced with good heart, conscious of the righteousness of cause, and confident of a victory in the cause of an ultimate peace for the world. Not only does this conflict, fierce, widespread, and appalling, strike home to us nationally, but it does so to us all as individuals and to our kith and kin through the precious life that is at stake. Other ways in which we are involved are of small account, compared with the larger issues. Royally and loyally in the national emergency came out the gas industry, taking as it does such an important place in the daily life and interests of the nation. It had only just emerged from a half year when high coal prices and poor markets for residual products had done much to mar an accustomed prosperity. But this made no difference whatever. With a single eye to its responsibilities, it set to work in the national cause. In its ranks—in its gas-works, in the works of the manufacturers of gas plant—were thousands of reservists (military and naval) and territorials. Every facility was at once given to these men to join the colours. Encouragement was given to other men to join the forces; and quite recently Sir Corbet Woodall was exhorting still others to offer themselves "as willing men." But there has been so much willingness that in some quarters inconvenience has arisen through the depletion of the ranks of skilled gas workers. In consequence, the Institution of Gas Engineers obtained from the War Office a pronouncement that such men were not now to be accepted for enlistment without a certificate from their employers that their services could be dispensed with. But to return to the prompt enthusiasm in the gas industry at the opening of hostilities. Liberal consideration was at once given in the way of guaranteed half pay or pay on other scale, with assistance for dependants during the absence in the country's service. Safe it is to say there will be no aggravating of local distress through the dependants of the workers of the gas industry. Contribution on considerable scale was also promptly made by gas undertakings and the manufacturers of the industry to the Prince of Wales' National Relief and other funds. The transport conveniences of the industry, constructed for heavy traffic, were commandeered, and even privately owned colliers that normally serve the gas industry went into the country's service. The wave of patriotism and loyalty to King and country rode as high through the gas industry as through any other constituent part of the nation. All of us identified with the industry in any place—high or humble or intermediate—are proud of it. Nothing has been done in which the industry has not taken part, and entered upon with sacrifices of no mean order. It will never be regretted. Duty called; the industry responded.

POSITION CREATED BY THE WAR.

But as an industry conducting a public service, there was other duty. Reduction of working staffs notwithstanding, directors and local authority committees took for their motto "Business as Usual." Staffs left behind to work and trade determined to show their patriotism by filling to the best of their power the large gaps left in their ranks. They are doing it well. But, of course, in company with some other industries, there will be variously loss of business. In districts where there are factories working at high pressure—providing clothing, boots, munitions of war, food, and all the requisites for the vast campaign, in the chemical industries' areas, in ship-building, and in other directions—the supplying gas undertakings will do well in gas consumption this half year. Nowhere, too, has employment fallen off to the extent anticipated; but there are areas where, through reduced consumption in industry, through the necessity for economy in homes, through the reduced lighting of streets and shops, by order of the authorities responsible for the defence of the country, there will be during the war a recession in the business for gas. Fortunately coal and oil are cheaper; and the supply plentiful—in the case of coal owing to the stoppage of a large proportion of export coal and the lessened quantity required by industry. Seaborne coal for the south at the opening of hostilities came quite plentifully. But insurances increased considerably, and were only partially lightened by subsequent action of the Government. There was a further easing when, on the great naval victory of the British Fleet in the South Atlantic,

the Board of Trade announced on Dec. 1: "The Government rate for the insurance of cargoes against war risks is reduced from 2 guineas to 1½ guineas." About that time we learned that the freightage for gas coal to well-known ports in the Mediterrnean was still 18s. to £1 per ton, which did not give much scope for "cheap" gas. With the falling price for coal, coke stocks again began to accumulate, and market prices fell. Tar for export was stopped. There came disagreement, too, with the tar distillers, who desired sellers to accept the value of the liquid products, less distillers' working expenses and profits, leaving payment for the pitch until such times as it would be marketed and paid for. A conference between a Committee of the Institution of Gas Engineers and the tar distillers resulted in what it was thought would be a satisfactory working agreement, the terms of which were recorded in our columns. But they were afterwards withdrawn. The position of sulphate of ammonia, too, became critical, largely owing to financial considerations in connection with shipments; but, as the Chairman of the Sulphate of Ammonia Association (Mr. D. Milne Watson) has recently announced, matters have improved in this respect. From this brief statement, it will be seen that, except in respect of gas in specially favoured areas, the position of the industry due to the war is not altogether a rosy one, though it is not anticipated that in the result the half year will be as black, generally speaking, as might have been anticipated. But though there will be a heaviness and a revenue shortage about it, it is being faced with cheerfulness, in the confident knowledge that the situation is temporary, and that, at the end of the war, things will again become normal, and progress will be on a scale that will gradually sink into forgetfulness current trading experiences. Naturally, the reduction of expenses has not been proportionate to the reduction of revenue; and in consequence of this, and the immediate outlook, some gas undertakings have found it necessary to raise the price of gas.

Dealing with Exceptional Problems.

Speaking generally, the position created by the war, and in which, of course, the gas industry in common with the rest of the country is involved, raised new problems, which required masterly handling and solution. Whatever our political creed, no one can honestly withhold from the Government a full measure of credit for the manner in which they encountered the unprecedented difficulties. It was not a time for petty treatment. War of such magnitude requires financing. Our Navy, supplemented by the navies of France and Russia, has prevented Germany and Austria doing any overseas trade; and the armies of the Allies have checked trading across the frontiers of the enemies' territories. The war is being carried on against the two countries with a doubled-edged sword. Their financial and economic stability is being weakened, while they are lavishly expending their resources in war. Not so with this country. It is in stronger case. The maintenance of our overseas trade, and the continuance of our industries at work, so far as material will allow, are the best means to sustain financial strength, and obviate drifting into a state which would sap the national vitality.

Immediately after the war commenced, the Government extended to the banking community the fullest measure of support and assistance, coupled with the reservation that the bankers in their turn should afford support to the industrial and trading communities, in order to maintain to the fullest possible extent the industrial population in profitable employment. Nor to the commercial community can the importance be over-estimated of the action of the Government in establishing a moratorium, in arranging for the discounting of pre-moratorium bills, in establishing an emergency currency, and instituting a system of war risks marine insurance, &c. But for these measures, it would have been impossible for the business community to have faced the situation. The re-establishment of foreign exchanges on a reasonable basis was one of the chief difficulties; but it was met. At first advances against shipments were almost unobtainable; but for this, too, relief was found. These things the Government achieved through conference with bankers, and with industry and trade through the Chambers of Commerce of the country. The rapid progress made in these directions did much to stop the paralysis which threatened industry and commerce immediately upon the declaration of war; and sounder conditions and a remarkable composure were the response to all that was done. In fact, the United Kingdom—"united" in truth to-day—has astonished itself at its own resource and powerfulness in a national emergency of unparalleled and unexpected proportions.

National Credit, Employment, Business Expansion.

Having done all this, the Government have also urged the giving of profitable employment to the fullest possible extent to guard to the utmost against distress. They have offered to lend money for this purpose to municipal authorities on the same terms as those on which the war loan was issued—the largest loan on record, £350,000,000—in addition to which, only shortly before, £90,000,000 was raised by means of Treasury Bills. These issues evidenced the magnificence of our national credit, and were a cause for national pride. So far so good for the provision of work by municipalities, with the Government permitting the dipping into such funds. But what of gas companies who desire to provide special employment? There will be room for such employment by them in the spring. There is employment to be given in many a gas-works in reconstruction and modernization work which would produce economy that would repay the outlay. It is a question of the provision of money in financially stringent competitive times; and gas companies (popular as they are in normal years as sources of investment) under the circumstances require something rather better than usual to offer. We have discussed ways and means in recent issues of the "Journal"—whether to any advantage, time alone can show. That there will be an expansion of the demands upon the industry as time progresses after the war, there can be no manner of doubt whatever.

The War in Trade.

The war has made another disclosure, and that is the extent of the ramifications of the trade of Germany in this country, and the enormous measure of its overseas trade. This, of course, was all officially known before. But to the British public, content with its own progress and native resources, and indolent as to what was proceeding in its very midst, it was not generally known. The public is cognizant of it to-day; and opportunity, encouraged by the Government, is being taken to relieve the country of its large German imports, and make it more self-reliant, while simultaneously equipping itself for taking over as large a proportion as possible of the foreign business of both Germany and Austria. The Government are fully alive now to the opportunities for strengthening the homeland at the expense of its arch-enemy. While the difficulties are great, and while trade of this magnitude cannot be captured by a single stroke of the pen, there is much profitable work in this direction to be done. Take, as an example, the aniline dye industry. In 1913, the German exports in aniline colours amounted to £7,100,000, of which the imports into this country represented some £1,800,000, whereas at home our own production was valued at only about £500,000 sterling. The British manufacturers and the Government have conferred; and there is a prospect, with Government financial aid, of a large development in this direction. The industry encouraging methods of Germany have not been the methods here; but there are signs that our Government have at length awakened to the fact—at least it is to be hoped that they have done so, for it is in the broadest interests of the nation that home industries should be legitimately and reasonably encouraged. In Germany there has been liberal State-aid of certain manufactures. Here there has been practically no such thing; and the competition has therefore been an unequal one. Examples of this have been published during the year. One has been in regard to alcohol, the use of which is required in large quanities in synthetic chemistry. Alcohol can be produced at a small cost per gallon; and in Germany the manufacturers requiring it obtain it at the low cost. But here the manufacturers are faced with a heavy duty. However, there is now a prospect of a large development of the aniline dye industry in this country, while Germany's overseas trade is crippled. This would naturally affect favourably the British gas industry's tar market. But in other respects there is not a large opening for the gas industry in regard to foreign trade, unless it be in strengthening its market for sulphate of ammonia, and maybe to an extent coke. Temporarily, the export of both these commodities

was stopped by the outbreak of war. The makers of gas appliances, too, may broaden their connections; for Germany and Austria did a considerable business in gas-meters, fittings, mantles, glassware, and other accessories. Through the Board of Trade, the Government appear willing to, if necessary, extend their protection and assistance to industries taking up the extension of production and trading during the period of the war; and where patents of foreign origin are necessary to development, arrangements can be secured for making use of them, providing they are not already being worked in this country.

The German manufacturer is wily; and there has been since the war started abundant evidence that he has been trying to maintain an oversea market in some productions through Holland and Denmark. It does not appear that he has met with any great success. Illicit trade of this kind has been tried in connection with mantles; but, besides the preventative of patriotism (which is of high order to-day), there is the law making illegal all trading with the enemy, directly or indirectly. One manner in which it was at first thought the British gas industry would be severely hit was through the stoppage of the mantle supply from abroad and the cessation of deliveries of nitrate of thorium. But that is another tale, to be referred to later. Meantime, it may be stated that companies have recently been registered for the purpose of supplying thorium nitrate to this country without—we hope—any reliance on Germany.

The High Tide of Foreign Trade and the Effects of the War.

What is now being done to develop the industry and trade at home and abroad during the war, through the impotence of Germany (whose economic conditions must now be in a bad plight), holds bright promise for the future, though in the eyes of some hasty individuals the necessary development moves but slowly. But what of the conditions of our overseas trade prior to and during the war? Our foreign trade in 1913, the returns showed, was of record order, despite the fact that Germany's rate of progress has exceeded our own. In 1913, our imports increased by £24,393,328, and our exports by £38,237,977, while re-exports decreased by £2,081,973. The net value of the increase was therefore £60,549,332—making, as we have said, the turnover for the year a record one. It is worth noting that the coal exports in 1913 increased in quantity by 9,600,000 tons; and in value by £11,074,182.

Following the high tide of prosperity, there was a little ebb early this year. Then came the war. By the end of November, the imports had decreased by £67,974,635; the exports by £78,182,699; the re-exports by £10,308,155. It is a matter for congratulation that, in spite of the war, the totals were larger than ten years ago for the same eleven months. Regarding exports of coal, in October alone this year, they were 2,908,547 tons less than in October last year, and in value £2,198,273 less. In November, the figures were 2,775,609 tons and £2,085,000. The slackened demand for iron and steel in consequence of the war also caused their prices to recede; but there was an upward tendency again in November. A gratifying feature was that, owing to some industries being kept working at maximum output through the war, through the stoppage of supplies from the Continent, and through the demands of other countries, and owing, too, to the big London building strike coming to an end, almost immediately on war being declared, and a truce being cried in other labour disputes, employment has not been nearly so bad as might have been expected.

Money, Stocks, and Shares.

The Money and Stock Markets—the barometers of the business man—in the first half of the year had their oscillations caused by the events of those months. Viewed from the standpoint of the present critical days, when nations are in deathly grip, those moving events appear puny. Ulster, Mexico, labour troubles, and the financial difficulties of other countries, in their turn or together, permitted the use of the time-honoured stock market terms "gloom," "clouds," "apprehension," and so forth. There were few "rays of sunshine," or "clouds with silver linings," or "rifts in the clouds," in the first half of the year. In most of the stock markets in 1913, there were heavy falls in values; and the first half of the current year did not do much to improve prices, or really to adversely affect them. The changes were frequent, but within narrow limits. The Bank rate opened at 5 per cent., on Jan. 10 it was altered to 4 per cent., on Jan. 29 it went down to 3 per cent., but, with war staring the nation in the face, on Aug. 1 it shot up to 10 per cent., but a week later it was put down to 5 per cent., at which it has remained. The most searching test that this country has ever had of its financial strength has been this war. At the opening of the year, Consols stood at about 71⅝-71⅞. The best price marked in the first half was 77-77½; but at the beginning of August, 69½-70½ was the quotation. At the beginning of September, the price was 67-68 *ex div.*; now offers are reported at 68½.

The prices of gas stocks—British and foreign—generally speaking, only wavered up or down by a point or two in the early months of the year. Then the Stock Exchange closed with the outbreak of war, and continues closed. Comparing the prices of gas stocks (as given in our weekly list) at the time the Exchange shut its doors upon business with those at the opening of the year, the differences are hardly worth noting. There was an improvement of 3 in Dublin ordinary; but the debenture stock receded. Brighton original and ordinary stocks went up 7 and 5 respectively. But Imperial Continental stock had a fall of 17; and there is no telling what price it would fetch to-day. Wandsworth 5 per cent. stock slipped back 4; but the Wimbledon and Epsom issues of the same Company were marked 6 higher. Since the Exchange closed, there have been a number of fresh issues of stock by auction, and, of course, there has been a recession of a few points in the prices obtained. Messrs. A. & W. Richards, who have their fingers on the pulse of the gas stock markets, inform us respecting their operations that, during the first half of the year, although they issued an "exceptionally large amount" of new gas capital, there was a very good demand at fair prices, yielding about 5¼ per cent. for the leading London-Suburban Companies, and about 5⅜ to 5¾ per cent. for stocks of more distant concerns. Debenture and preference stocks continue in less favour with investors than ordinary stocks. Recently, the firm have sold a large amount of stock—principally ordinary; and, war conditions notwithstanding, good London-Suburban stocks have sold on the basis of a yield of 5½ per cent. [For Messrs. Richards' full comments, see p. 748.]

Commercial Experiences of the Industry.

The sustained public confidence in gas stocks and shares, in face of anything but the best commercial conditions for the gas industry, is very satisfactory. It is a public testimony to the high credit possessed by the industry, and to the reliance born of experience in the prudence of gas administration. In times that are commercially bad for the industry, the value of good reserves is felt by gas undertakings, especially by companies, and so, too, is the value of a low capital charge per 1000 cubic feet of gas sold. The trend of things the past few years has helped materially—through the greater production of gas per ton of coal carbonized, through the raising of the valleys in the daily output curve, and through the growth of business—to bring down the average of the capital charge per unit of output; and the advantage of this is felt particularly in times when other factors in the situation have not been of the most propitious order. And they have not been this year. The use of high priced coal under the contracts entered into last year continued well into the second half of the year; the price of oil, however, was a little easier. The downward tendency of the residual markets remained unchecked. While, after the exhaustion of the dear coal, the current half year has benefited by cheaper raw materials, the war came in to cause a heightened density of the cloud over the residuals market, though there has since been some relief.

Speaking generally, the atmospherical conditions have varied between two extremes. The year started cold, summery weather came early and stayed late, towards the end of the year we have had some good weeks for gas consumption for heating purposes, owing to the cold and cheerless climatic conditions, with high winds and abundant rain. Speaking generally, the increase of consumption for the whole year would have been well up to the average of recent years, had it not been for the untoward circumstances. In the second half of the year, the war, of course, had a bad effect in some areas, while in others business was, after the first shock, actually stimulated by it, and owing to the closing of the trade outlets of Germany and Austria. In the Metropolitan area especially, the reduced street and shop

lighting as a precaution against the coming of Zeppelins which do not come, and the closing at 10 p.m. of public houses and other places where intoxicants are sold, together with the fewer places of public amusement opened in the evening; at the seaside resorts, the stay-at-home policy adopted by the public, instead of taking their annual holidays; and throughout the country, the general economy, forced or adopted as a tribute to the influences of war—will all tell their tale on gas consumption. When the statistical story of the half year comes to be told, and one is able to make comparison, there will be curious and divergent findings. We are afraid that the good story told by the Board of Trade returns for 1912-13, and the one expected for 1913-14, will not be repeated in 1914-15. In the last-issued returns (1912-13), it was shown that the increase in gas business during the year for statutory undertakings was about 10,000 million cubic feet.

The narratives regarding the working of the first half of the year—as told at the August meetings of the Metropolitan Gas Companies, by Sir Corbet Woodall, D.Sc., Mr. Charles Carpenter, D.Sc., and by Mr. W. G. Bradshaw—are all examples of those that had to be voiced almost generally throughout the country, other than in regard to the variation of percentage rates of increase in gas consumption, and the local differences in the disposal of coke. But a general experience was that the numbers of consumers continued to increase, and that the numbers of gas-heating appliances, domestic and industrial, connected-up continued to help to broaden the base of the industry's trading. On the other hand, a further almost general experience was that the reserves had to contribute to the balancing of the sums needed for the payment of interest and dividends. They will have to do so again this half year in not a few cases, notwithstanding the fact that some companies have, owing to the conditions produced by the war, with the unhappy markets for residuals, had to raise the price of gas—the Gas Light, South Metropolitan, and South Suburban Companies, for example. This question of raising present prices has been discussed in several places; but the general feeling is that municipal gas-owning authorities should not take this course if the doing so is only to gain profits in aid of the rates, while gas companies, under the exceptional circumstances, should only advance the price as a last resort, in order to enable them to do full justice as between shareholder and consumer.

From the Continent, somewhat the same story came regarding the residuals markets; but from certain of the more distant places—notably Australia and India—reports were received that the residual products markets had been good, and gas sales satisfactory. There was still a weakness overhanging South African gas undertakings, though things appeared to be brightening-up a bit in the time intervening between the composure of the labour troubles and the easily crushed rebellion. The gas company occupying at the moment the most curious position of any gas company in the world is the Imperial Continental Gas Association. At the meeting held in May, a good account was given to the proprietors; and the work that was being done by the Board in broadening the area of the Company's operations was spoken of with good hopes of successful business expansion resulting therefrom. Before the shareholders met again, the German Government had taken the Berlin works under their protection and management; the Hanover and Linden Municipalities respectively those supplying the two towns; one station at Antwerp had had a small amount of damage (only about £2500 worth) inflicted by shells; and Brussels had been occupied by the Germans, so that intelligence as to the business there had practically ceased. Some of the towns in the North of France, in the gas supply of which the Association are interested, had been bombarded, but so far as could be gathered, except perhaps in one small instance, damage to gas property was almost negligible. The Directors were unable to prepare any accounts for presentation to the proprietors at their November meeting; but knowing something as to the course of the business done during the first half of the year, the Board decided to pay on account a dividend of 2½ per cent. A very interesting statement as to the position of the Association was made at the meeting by Sir Charles Jessel; but, of course, few definite details were available, and the future must be left to unfold itself.

Returning home, the evil times upon which the Alliance and Dublin Consumers' Gas Company had fallen constituted a matter of very grave concern to the investors in the undertaking, and one of more than passing interest to the gas profession. As a result of the appointment of Mr. William Newbigging and Mr. W. R. Herring to make an investigation into the technical and commercial management, and of Mr. William Cash, F.C.A., into the financial position, a report was prepared. Only a limited number of copies, however, were printed, and these, as far as possible, were closely guarded by the Board. But with all their efforts at concealment, the tenor of the dismal findings leaked out; and it became common property that drift and avoidable uneconomy were largely responsible for the serious situation. Certain Directors from the Lancashire district were placed on the Board. The advocacy in our columns that a Technical Director should be appointed was opposed by the non-technical members of the Board. But they did the next best thing. Mr. William Newbigging was appointed Consulting Engineer, and the work of reformation was put in hand. Better results promptly began to disclose themselves. The General Manager and Secretary (Mr. Francis T. Cotton) and the Engineer (Mr. William Cotton) resigned their positions; Mr. W. J. Grey was then appointed Secretary; and Mr. H. F. Cotton (formerly City Lighting Engineer) is taking up the duties of Distribution Engineer. Good hopes exist of a return to a sounder state of affairs.

The municipal record of gas trading for the year was much the same as that of the companies, so far as raw material, bye-products, and financial results go. Notable among the municipal events of the year was that at Manchester the experiment of applying a percentage system to the appropriation of profits in aid of the rates was abandoned; and a resolution was passed by the City Council in favour of a lump sum from each department. Widnes, too, beat its own famous price record by a reduction of charges for gas—making them 1s. to ordinary consumers below a consumption of three millions a year, 10d. to all consumers above three millions, 8d. to users for motive power. Prepayment consumers are now being supplied with 66·6 cubic feet of gas for 1d. Free inspection and maintenance of incandescent burners (only material being charged for) has also been adopted. This reduction is largely attributed by Mr. Isaac Carr to the use of more spacious horizontal retorts and heavier charges, worked by the Fiddes-Aldridge machine. On the subject of profit appropriation, among the papers published during the year was one by Mr. Harold E. Bloor, in which he held that some compensation was required by municipal administration as an inducement to continued effort. Some notable examples where there is no profit appropriation show that there is sufficient stimulus for some municipal councillors in rendering gas undertakings of the greatest public service. A serious thing is the disability under which municipal administration labours in that, owing to the keen sensibilities of local tradesmen, their business developing operations are often restricted. As Mr. Robert Watson pointed out in a paper in which this matter was discussed, the result is seen in the average consumption per consumer (calculated from the Board of Trade returns) being much less than in the case of companies.

Recurrent is the promotion of companies, with high sounding names, big capitals in relation to business, and glorious certainties—on paper. A concern formed under the style of the United Gas-Works Development Company (what among its operations suggested the appropriateness of the term "United," nobody can divine) has fathered two more concerns which have for various reasons not commended themselves to us—the one was the East Pembrokeshire Gas Company and the other the Wilts County Light and Coke Company. The nuclei of these two conerns and the embellished predictions (in the prospectuses) of a golden future were most amusing.

Financing Gas Companies During and After the War.

Among the important subjects discussed during the year was that of the financing of statutory gas companies during and after the war. It was recognized that, in the inevitable scramble for money—for war loans, and for capital for business expansion at home, with good rates of interest and security on offer—gas companies would be placed at a disadvantage in raising capital if, as the result of a compulsory increase of the price of gas due entirely to circumstances created by the war, dividends were reduced, and the attractions of their stock as an investment were thus depreciated. It was suggested, in an editorial article in our columns on

Nov. 3, that Parliament should be asked to allow the suspension of the sliding-scale so far as the dividend is concerned in respect of any increase in the price of gas forced upon companies by conditions arising from the war, till such time as the Board of Trade were satisfied that these conditions no longer had influence upon the operations and position of the companies. Further, that there should be simultaneous relief from the auction clauses, so that capital could be placed in the best market and on the best terms procurable. Mr. W. R. Herring subsequently suggested that gas companies should obtain powers enabling them to raise a larger proportion of mortgage or debenture stock at a rate of interest not exceeding 5 per cent., with redemption and re-issue powers as the market becomes more favourable. Of course, to the extent that there was excess of loan issue beyond the authorized proportion, there should be, he further suggested, a reduction of the authorized ordinary or preference capital. It was submitted by Messrs. R. W. Cooper and Sons that Mr. Herring's proposal did not go far enough, in that it did not do anything towards maintaining the value of the existing capital; and they indicated concurrence with the views expressed in the editorial article published on Nov. 3. A point of interest was mentioned by the firm, in their letter—to the effect that one Bill which was being promoted in the current session was, under the stressful times, asking for relief from the auction clauses.

Publicity Work and the Development of Sales.

The British Commercial Gas Association has been as active as ever during the third year of its existence. There being no National Gas Exhibition this year, the work of the organization was lightened of the heavy share it took in that imposing event of 1913. In two ways, the exhibition was brought to mind from time to time—one was by the reports which reached us of benefit having accrued from it in quite distant places; and the other was through the effort made to clear off the deficit occasioned by the exhibition receipts not equalling expenditure—an excess in expenditure having been caused by unexpected requirements and labour events. This effort has not been successful owing to the stubborn refusal of a number of gas administrators to take part in any co-operative endeavour, while enjoying the fruits of other people's work and expenditure of money and time, and the exercise of brains. However, the Association, now familiarly known as the "B.C.G.A."—maintained the level of its propaganda work by advertising, by newspaper articles, and in divers other ways—in directions among others where influence lies, but in regard to which the President (Bailie Paxton), the Chairman of the Executive Committee (Mr. F. W. Goodenough), and the several others who are members of this energetic machine do not think desirable to shout from the housetops. The literature of the organization is maintained at a high standard; and, as a central institution for conference and advice, its work has much increased, and is unparalleled in the history of the industry. Due to the war, the annual conference was not held this year, though all arrangements had been made, on the invitation of the Lord Provost and Corporation of Glasgow (whence Bailie Paxton hails), for one in that city. What happened was merely a business meeting in London; the President was then continued in office; and the invitation and all arrangements for the conference this year were simply projected into October of next year. But very useful District Conferences were held—this being a successful innovation—at Plymouth, Bradford, Glasgow, Newport (Mon.), Redhill, Newcastle-upon-Tyne, and Leicester. Popular features of the conferences were the lectures by Professor Vivian B. Lewes. Prominent in the Association's advertising campaign this year has been the pushing home, in connection with the lamentable war, of the advantages, in hospitals, nursing homes, and sick-rooms, of gas-fires and hot-water supply appliances. Among other things, the Association has linked itself with the work of the London Coke Sales Committee, and so is able to spread the benefit of that work, and of their own in this direction, broadcast through the United Kingdom.

In connection with this publicity work, the gas industry has spasmodically been assailed by persons whose want of scientific knowledge on the hygienic question is exposed by the attacks; and the Association has taken part in counteracting the attempted mischief—not by reprisals, but by using its resources for the dissemination of the scientific truth of the matters. We shall have more to say upon the subject of electrical competition in our "Electricity Supply Memoranda" next week. The attack of the retail coal merchants, who are feeling a draught from the supersession of smoke-producing fuel by gaseous fuel for domestic heating and hot-water supply, apart from the almost (in some districts) universal use of the gas-cooker, was taken up by the Association, and some very suitable literature prepared in reply. Nothing much has been heard of suction-gas competition this year. It exists; but with lower prices for gas used for power purposes, it does not make progress at the rate that it was doing a few years ago. Manufacturers have found out its disadvantages, and prefer paying even a little more to secure the comfort and constancy of town gas.

There have been two notable exhibitions during the year on the Continent—one at Munich, and the other at Lyons. But there has not been anything of a large nature at home. A growing method of locally demonstrating the uses of gas is by fitted model rooms in connection with show-rooms. The methods adopted by various undertakings for the development of business have been described in several papers and articles published in our columns; and from them it is noticeable how the system of hiring-out all kinds of appliances is extending. Scientific salesmanship and enthusiasm in the work have formed the subject-matter of advisory papers by Mr. R. J. Rogers, Mr. W. M. Mason, and Mr. R. Halkett.

Coal Topics and Prices.

Coal was naturally a topic of much discussion in the early part of the year. The adverse influence of its price upon the prosperity of the industry, combined with low values for coke and sulphate of ammonia, was an ever-present source of anxiety; and there were many searchings around for signs of a break in the conditions which enabled coal owners to maintain the prices to British buyers so much above justifiable figures. The early returns as to foreign trade showed in the forepart of the year a changed course, and some of our own home industries began to exhibit a slackening-off. But the export trade in coal appeared to be sustaining its vigour. The returns relating to coal exports for 1913 presented the fact that they were some 9 million tons in excess of 1912, and the value higher by £11,074,182. As the coal exported in 1912 amounted to 64½ million tons, 9 million tons added to this made approximately the enormous export of 73½ million tons in 1913, from a total output of 287½ million tons. Mr. Charles Carpenter, in one of his addresses to the proprietors of the South Metropolitan Gas Company, made an interesting suggestion. Much of the coal, he said, that was sent abroad from this country was used for obtaining metallurgical coke, and the companies carbonizing the coal employed the gas, and had the advantage of the bye-products, including the motor spirit, for which every country, ours included, is asking. Why not, he submitted, keep the coking of this coal at home, and then export the coke. There has been no answer to this, though it is quite obvious that the coke would not answer the purposes of foreign buyers the same as the coal, a proportion of which is used for gas-manufacturing purposes. Besides the transport of a ton of coke, through taking up more room than a ton of coal, would cost proportionately more than the coal, and have less intrinsic value. Owing to the war, in the second half of the year, exports considerably diminished, coal was plentiful, and prices eased. There was occasional delay in connection with railway transmission, owing to the shifting of troops and war material. But, except in connection with south-coast towns, there was at first little difficulty in connection with seaborne coal to London and other destinations on the Thames. But later, when indiscriminate mine-laying by the enemy and elusive hostile submarines were wandering about, regulations all along the east and south coasts became more stringent, and traffic from North to South was not so comfortable, free, or regular.

Just about the time in the spring when consideration was being seriously turned to the subject of gas-coal contracts, a report found its way into the Daily Press to the effect that a large London gas company had entered into contracts for German coal. The report gathered strength with time—the quantities contracted for increased, and the purchasing "company" was converted into "companies." As to who were the companies and what were the quantities, there was some uncertainty; and the secret was well kept. A question was asked in the House of Commons; and the reply was only definite up to the point of saying that a London gas company had entered into a contract for coal from

Germany. All through we scouted the idea of anything like the quantity named having been contracted for. The whole matter very soon faded out of sight. The "Iron and Coal Trades Review" urged upon the coalowners absolute cohesion in obtaining the "full" market price for gas coal. The miners, of course, did not like the prospect of lower prices affecting their wages; but it was only in the Scotch coalfield that there were really any decided indications of unrest and trouble. The Scotch owners, in view of the additional costs of working owing to modern legislation, and to the fact that there was a reflux in trade, desired to reduce wages. The miners objected, and proposed that the selling prices of coal should be fictitiously maintained by working, and so restricting the output, only four days a week. In other words, they wanted to keep up their day's pay by sacrificing a day's work per week. The miners did not get any encouragement from the Miners' Federation in trying to make their grievances a national affair.

In regard to prices, our Northern Correspondent stated, immediately contracts were effected, that those entered into with the London gas companies ranged from 10s. 7½d. to 12s. per ton f.o.b., which was equal to 14s. 3d. to 14s. 10½d. delivered. At the Gas Light and Coke Company's meeting in August, Sir Corbet Woodall stated that the new contracts showed an average reduction of rather more than 2s. per ton; and at the Tottenham Company's meeting he mentioned 1s. 8d. per ton as the reduction secured by them. Mr. W. G. Bradshaw, at the Commercial meeting, spoke of 1s. 8½d. per ton reduction. It was also announced that oil had been contracted for on more favourable terms. Our market reports from the Newcastle district show the gradual decline from the opening quotations (which were the highest for the year) to those recorded about summer time; and it is clear that it has been a great struggle to uphold prices. Towards the close there has been further shrinkage; and yet quotations now stand somewhat higher than the prices mentioned above at which contracts were closed in the late spring or early summer.

Coke Position and Sales Development.

The residual products of gas manufacture naturally occupied much thought and attention. The poor condition of the coke market with which the year commenced continued, though cool weather and a strike of coal porters in London did something in the early part of the year to cause a little spurt in demand. But the long and widespread strike in the building trade in London came along as a factor in intensifying the depression; and ultimately the war caused the position in some areas to go from bad to worse. Certain districts, however, on the North-East Coast, for example, had their sales helped by the demands from Norway and Sweden—German traffic therewith having almost ceased. During the war, experiences in coke disposal varied greatly, generally according to local demand for industrial use, and the situation for meeting external requirement; but, owing to the retail prices of coal for household purposes being continued at about normal figures, and stocks of coke accumulating, the prices of the latter were anything but such as could be boasted about.

There were two matters that received prominence in the course of the year in connection with coke sales. They were the need for an improved quality, and the necessity for the development of the demand, for which it is quite evident there is hitherto neglected scope. Mr. J. G. Newbigging, Mr. Thomas Glover, and others called special attention to this matter. Desired is a drier coke than hitherto, coke of better physical characteristics, and coke well screened and graded. Drier coke is obtained in the continuous vertical system; and coke of closer texture is obtained in the intermittent system; while coke of much the same physical characteristics as horizontal retort coke is obtained in the Wilson intermittent-continuous retorts. The quantity of water that can be absorbed by hot coke is remarkable; and when coke contains 3 to 15 per cent. of moisture or washed coke 20 to 25 per cent. as it leaves the washing-tanks, and remembering, too, that 9 per cent. of moisture lowers the calorific value by 10 per cent., the importance of dry coke to the user is clear. He does not want to pay for water instead of carbon. Various systems of dealing with coke from horizontal retorts to prevent undue moisture have been suggested —for example, the "Dryco" system as at Liverpool, and specially constructed draining-places. The latter system is good up to a point; but the amount of water held in suspension is still great. The question of ash in coke, which is also an important one, has been discussed; but it is not so controllable as moisture. It has become more and more clear, too, that gas-works will, to assist disposal, have to produce coke which will meet the requirements of local markets for hard coke, as at Birmingham.

In addition to conferences, the London Coke Sales Committee and the British Commercial Gas Association have been extremely active in connection with coke; and through the technical expert of the former (Mr. E. W. L. Nicol), they have been working hard to spread information as to the use of coke for steam-raising, and for heating large quantities of water in households and business places. Some illuminating articles on the subject of the use of coke for steam-raising were contributed to our columns by both Mr. Nicol and "A Gas Engineer;" the main lesson being that coke properly applied and prepared, and given a simple forced draught arrangement where required (a simple one was described by Mr. Nicol), there is a large field here for the disposal of coke. In his evidence given before the Smoke Abatement Committee, Mr. Edward Allen mentioned that at Liverpool a Babcock and Wilcox boiler had been running on coke from 1895 to 1910 without the renewal of a single tube. Gas engineers should make their works an illustration of this use of coke, where it is not already the practice. For the provision of hot water, the "London" coke-fired boiler is a fresh introduction, meeting with public favour.

As to prices, it is impossible to quote any general ones. They have varied largely as between district and district, demand, and character of production. Our Northern Correspondent mentions that the year opened with good coke fetching 14s. 9d. to 15s. 6d. per ton f.o.b. Tyne; but a downhill tendency throughout the year has brought the quotations, with greater makes, to from 10s. 9d. to 11s. 9d. The German Gas-Works Residuals Society in their report for 1913-14, stated that in the coast districts there had been keen competition by English coke, and this had been much felt —the price having been sometimes as low as 9s. f.o.b.

Tar and Pitch.

In the first half of the year, tar was the best feature in the revenue statements of residuals; but the war caused serious difficulty. Exports were stopped; and the home tar distillers suggested terms for the liquid products (leaving pitch to be dealt with later) which did not commend themselves to the producers. Pitch was the real "bone of contention." Conference with the distillers produced amended terms; but these were afterwards withdrawn. The matter therefore continued one of some complexity. During the year various authors of addresses and papers—the Presidents already alluded to, and notably Dr. W. B. Davidson—addressed themselves to the question of improving the yield, quantitatively and qualitatively, of the liquid products of gas-works. The practice of tar distillation, either by gas-works individually where large enough or by combinations capitalized by people financially interested in the gas industry, will be a question of policy for discussion in the near future—just as interest on the same lines has been aroused, through a suggestion in our columns, in the subject of the production of sulphuric acid by individual works or by combinations capitalized by gas stockholders. The Road Board have revised their specification for tar for road purposes; one modification being that the tar shall contain not less than 12 per cent., and not more than 21 per cent., by weight of free carbon. An interesting development in the application of tar to roads was made by Mr. Glover in describing what he had done at Norwich in the construction of road surfaces by tar macgrout. The only people who now really find any cause of complaint against road tarring are the water companies, owing to the less water required for dust-laying, and therefore to them there is a loss of revenue. With the developments in the aniline dye industry at home, the future for tar is not at all a dismal one. On the whole, had it not been for pitch, tar would not have done badly. Fortunately there was a revival of pitch shipments towards the end of the year, though only in quantity about one-half that of the corresponding month of 1913, and the home pitch trade had also grown tolerably active. At the end of the year the Army Council gave gas-works notice that they required placed at their disposal all the toluol produced, or the substances containing toluol, so far as the same were not covered by existing contracts. Tar market values derived from different sources varied fairly considerably—partly due

to situation, and partly to quality. The opening figures, however, were the best of the year; and then there was a distinct decline, until the war. Succeeding came the trouble over the disposal of tar and pitch on the distillers' terms; and afterwards the quotation appeared as the value of the liquid products in a ton of tar—the first quotation given was 15s. 9d. to 17s. 3d. This went up 1s.; and to-day it is 16s. 9d. to 18s. 3d.

Sulphate of Ammonia—The New Association.

Sulphate of ammonia had a dreary outlook in the opening months of the year, and a drearier one later on. The lower prices of 1913 continued. In that year, the average was £13 7s. 6½d. (or £1 0s. 2½d. less than the average of 1912), notwithstanding that there was an increase in exports to the extent of 37,840 tons (making exports from the United Kingdom 324,704 tons). The total production in the year was stated by Messrs. Bradbury and Hirsch to be 420,000 tons, or an increase of 32,000 tons. But the subsequent returns received by Mr. W. S. Curphey, the Chief Inspector under the Alkali Works Regulation Act, gave a total production of 432,618 tons. This advance in production at home (which in normal times is bound to increase from the coke-ovens, and from the greater attention to the conditions assisting in ammonia recovery in gas-works) was accompanied by a substantial increase in Germany; and Germany commenced to be a serious factor in the export market, with its 25 per cent. ammonia quality. It also dawned upon the sulphate of ammonia producers in this country that synthetic ammonia by the Haber process (using nitrogen from the air) had become a real live factor in the situation, and a competitor with the produce from coal carbonization. Sir William Crookes published the information that the Badische Company would have plant equal to the production of 130,000 tons in use by the end of 1915. It is quite plain that an uncontrolled production of synthetic ammonia would spoil the producers' own market; and there is not the slightest doubt that thanks were due to the German Sales Committee for the success that they achieved in bringing to a successful conclusion the restriction of the output of synthetic ammonia. But what will now happen is a matter that is in the lap of the gods? Another growing competitor in the fertilizer group is cyanamide. In this case atmospheric nitrogen is conducted through a mass of calcium carbide, and calcium cyanamide is produced. The production is increasing in Sweden and Norway. At Odda the additional carbide plant authorized some time ago will increase its capacity to 80,000 tons; while plant working at Niagara has been increased from 12,000 to 32,000 tons, and the extensions in progress will mean an enlargement to 64,000 tons. There has been some talk regarding the recovery as ammonia of cyanogen compounds in gas. With higher heats and the cessation of lime purification, there has been an increase in the total quantity of cyanide compounds present in the gas; but all the evidence seems to indicate that the cost of conversion into ammonia would not render the system a profitable one.

However, under the circumstances of greater production, and the growing sources of output, and owing to the want of an accredited organization which would be able to enter into negotiations with other similar bodies abroad, a Sulphate of Ammonia Association has been formed in this country into which the Sulphate of Ammonia Committee has been merged. The Association has two distinct sides—the one the selling side, and the other the propaganda; so that sulphate of ammonia producers can belong to both, or either the one side or the other. Some adverse criticism has been levelled—not very much, and it has been of a subterranean order—against the selling side of the Association, which has incorporated in its membership the very largest producers, from the gas, coke-oven, and shale-oil industries. The suggestion that it is a "ring" has broken itself against the rock-like facts of the position. The greater part of the production of the United Kingdom is disposed of by export, there are competitors abroad now, and a central authorized body was a necessity for the maintenance intact of our place, and the obtaining if necessary of a larger place, in the export trade. Putting these facts together, the individual producer must see the *raison d'être* for the existence of the new Association. Germany has its Sulphate of Ammonia Association, and its Residuals Society. These have been for some time in existence; and this is yet another instance of Germany's trade thoroughness. Our home Sulphate of Ammonia Association (of which Mr. D. Milne Watson is the Chairman, as well as of the Propaganda Committee, Mr. Thomas Milne having recently resigned the chairmanship of the latter) showed its value when the sulphate of ammonia export trade broke down on account of the financial position created by the war. Through the instrumentality of the Association much irrecoverable loss has doubtless been averted. Now that shipments have been recommenced with safety, the Association are urging the importance of maintaining a competitive quality of sulphate of ammonia—material that contains 25 per cent. of ammonia, not more than 3 per cent. of moisture (2½ per cent. is quite enough), and ½ per cent. of free acid is what is now wanted by buyers. Bearing on quality is the question of discoloration; and the causes of this has been the subject of technical contribution during the year.

Regarding the development of the use of sulphate of ammonia at home, Mr. John West contributed a valuable paper at the meeting of the Institution of Gas Engineers in Liverpool last June—a paper containing the results of actual agriculturul experiences.

A few words as to the production of sulphate of ammonia. There has been much said this year as to the loss of ammonia on gas-works—from seal-pots and liquor storage tanks; and preventative means have been discussed. Professor J. W. Cobb, the Livesey Professor at the Leeds University, in conjunction with Mr. Harold Hollings, B.Sc., has also been considering (and is still doing so) the influence of red-hot coke and high temperatures on the decomposition of ammonia. But, on the other hand, heavier charges in horizontal retorts and vertical working have resulted in increased yields. There is still plenty of room on some gas-works for enlarging makes of sulphate of ammonia per ton of coal carbonized. In his Institution paper, Mr. George T. Purves mentioned that, with the "Otto" direct recovery process, he was obtaining in coke-oven working 36 lbs. of sulphate of ammonia per ton of coal. Some discussion has taken place respecting the application of the direct-recovery system to gas-works operation. There is little question that it will come into still greater use, and partly, it is anticipated, on grounds of economy. One gas engineer reports good results from an experimental plant. Mr. Thomas Glover gives £4 as the cost of ordinary sulphate of ammonia manufacture after the liquor has been produced, as against £2 per ton by the direct process. What is wanted, however, is a complete balance-sheet as to the financial results of the introduction of the system into a gas-works plant, and conclusive information as to its effects upon the gas produced. With the weak acid solutions now used in connection with coke-oven plants, it does not appear that there is much over which complaint can be made in regard to the quality of the gas; but the whole matter requires thorough investigation from the gas-works point of view, because it stands to reason that, with greater sulphate of ammonia production and competition, gas-works must produce as economically as possible. It is stated, but there seems an amount of conjecture about the assertion—that the cost of production by the synthetic process is £4 per ton. We will not guarantee the figure. But comparing it with those previously quoted on the authority of Mr. Glover, indicates that the synthetic system cannot in production costs compete with the direct system—assuming the figures are correct. However, it is thought by some that too much is being made of the production of synthetic ammonia; and one authority at the beginning of the year said: "It can be confidently stated that the new artificial makes are not expected to exceed what can be readily absorbed, and that the make in Germany for 1914 will only slightly, if at all, exceed the 1913 figure." It is better to over-estimate than under-estimate a competitor.

As to prices, at the commencement of the year, the best figures were quoted that were obtained at any part of it. From various quarters, quotations, according to position, for 25 per cent. quality, ranged from £12 7s. 6d. to £12 17s. 6d.; but soon after it was ascertained that Continental makers were accepting much below British prices. As the year progressed there was a whittling-away of values until they fell below £12, and then gradually to below £11. Anything between £10 2s. 6d. to £10 17s. 6d. was being quoted about June in various quarters. In July, things were more hopeful; and prices were firmer, but still under £11. Then came the war, and practically a suspension of business, till shipments recommenced in a relatively small way a few weeks since. Some makers then preferred to stock rather than accept dealers' ideas of values. Though business at

£9 10s. was heard of, prices quoted gradually improved, until towards the end of the year figures round about £11 were spoken of.

Nitrate of Soda.

The information published as to nitrate of soda was interesting. In 1913, there was a falling off in consumption; and in that year, too, there was the agreement as to restriction of output. But this agreement came to an end last January. In the first six months of the year, the estimated consumption in Europe was 1,497,000 tons—an increase of 1½ per cent., but in the United Kingdom there was a decrease of 2½ per cent. It was also reported that the value of cargoes at the beginning of January was about 9s. 7d. per cwt. (cost and freight), but subsequently it dropped to 9s. and 8s 10½d. In January, the market quotations were 10s. 6d. per cwt. for ordinary and 10s. 9d. for refined quality. The figures afterwards wavered round about 10s. On war being declared, there was a little spurt upwards, to 11s. 3d. and 11s. 6d.; but this was only a "flash in the pan," and 9s. 6d. for ordinary and 10s. for refined were mentioned towards the end.

Benzol as a Motor Fuel.

This is a subject that has been kept well to the front during the year by certain papers interested in the mechanical propulsion of vehicles, and by those concerned in low-temperature carbonization systems. But although it has been demonstrated that more mileage can be obtained from benzol than from an equal volume of petrol, and that there is no disadvantage from it when properly applied, no great advances were made towards the quantitative development of its supply. The idea of obtaining supplies by stripping town gas fell almost out of consideration. The calorific power standard will not allow of this being done; and when the advantages and disadvantages are taken into account with the financial considerations, nothing is found in the suggestion that is worth pursuing under present circumstances. At coke-oven plants there has been an extension of the recovery process. But certain observers doubt if much reliance can be placed on any considerable enlargement of the production of motor spirit from this source, seeing that coke must continue to be the primary and regulating product, while the expected development of the purchase of coke-oven gas, as at Middlesbrough, for town supply will reduce the volume of gas stripped for the recovery of benzol. Of course, there is still the tar as a source of supply. Low-temperature carbonization processes did not make much progress, in contributing to the supply of motor fuels, although, from experiment and on paper, some wonderful hopes were exposed for the admiration of those concerned. During the year a Committee was appointed for the object of investigating the production and use of alcohol for motor purposes; and Dr. Ormanby, on the sides of the alcoholists, read a paper on the subject at the Society of Arts. Many of his statements, however, were challenged on behalf of those interested in benzol, and the alcoholists were described as being visionaries. There is rather a stern battle still to be fought out over this question of the supply of a home produced motor fuel.

Applications of Gas—Lighting and the Mantle Position.

Coming to the applications of gas, there is no startling improvement to chronicle in connection with lighting. But through the war, there is one matter that has caused some consternation. Well known to many in the gas industry, and yet a settled content with things as they were, was the reliance of this country upon Germany for its nitrate of thorium for mantle making. German mantle makers and chemical manufacturers have been far-seeing; and it has been a lucrative thing for them to control the nitrate of thorium supply. Though we have makers of mantles in this country, enterprising, and willing with a guarantee of home support, to meet the requirements of the United Kingdom, they have been the dependants of Germany for thorium nitrate; and it has not been very encouraging to them to see that the imports of mantles from that country have far exceeded the demands for the home brand of goods. This has not been due to a question of quality, but to a small difference in price, made possible by the large patronage of Germany, and the favoured position in which that country stood in regard to the primary raw material. Early in the year, there was an advance of 30 per cent. in the price of thorium nitrate. There was no justification at all for it, in view of the increased sources of monazite sand supply, which, unfortunately for this country, are either directly or indirectly controlled by Germany. The intrinsic values of the monazite sands from the extended sources of supply were described in a paper that Mr. S. J. Johnstone, of the chemical staff of the Imperial Institute, read before the London Section of the Society of Chemical Industry; and the source of the sands mentioned by him as being richest in thorium was Travancore in India. But it seemed to be nobody's business in this country to inquire why we, of the United Kingdom, should be dependent upon Germany, when in our own Indian possessions there was a huge deposit of rich sand. The truth came out with the declaration of war, and the stoppage of commercial relations with Germany. A concession for the Travancore sands had been obtained by the Travancore Minerals Company, in which a controlling interest is held by the General Electric Company, makers through the Osram Works Limited, of the Osram electric-lamps in this country. A large part of the capital of Osram Works Limited is held by the German Auer Company; and the German Auer Company were the sole contractors for the Travancore sands through the (British registered) Travancore Minerals Company! Some attempt has been made to alter this anomalous condition of things; and one or two thorium supply companies have been formed in this country. About them and their proposals we shall be able to state more later on.

The position at the outbreak of war looked ominous; but there was standing, as a protection to this country, the store of nitrate of thorium—several thousand kilos—that had been accumulated by the statesman-like action of the late Sir George Livesey, and the present Chairman (Mr. Charles Carpenter, D.Sc.) and the Directors of the South Metropolitan Gas Company. When the position became known, there was a rush of buyers of mantles in large quantities; and this rush—unnecessary as is proved—caused the prices of mantles to ascend. But though prices are somewhat more now than the pre-war ones, there is no occasion for alarm, and there is no need to pay exorbitantly. Efforts have been made to open-up trade in German mantles through neutral countries; but, trading directly or indirectly with the enemy being illegal, there is not much chance of any great success in this direction. The subject of the supply of glassware has been rather a troublesome one, as Austria and Germany were both sources from which considerable supplies have been drawn; but the war has given more work to our own manufacturers.

In lamps there has been during the year no improvement other than in details; but in the high-pressure line improvement has been effected in small units, making them of almost equal efficiency to the large ones. The application of high-pressure lighting in the City, with central suspension, on a larger scale than before (under the new street lighting contract), was duly completed. Information was also published as to large extensions of high-pressure lighting in the streets of Paris. A distinctly disinterested statement as to the merits of the high-pressure lamp was made by Mr. C. F. Lacombe, the Chief Engineer of Light and Power of New York City. The light from the yellow flame arc lamp, he said, could not compare with the clear brilliance of the light of the high-pressure gas-lamp. In connection with street lighting, several local authorities have obtained from Parliament the power to fix to private property brackets for the purpose of the central suspension of street lamps. Some good contracts for street lighting by gas have again been secured. For example, the Reading Gas Company won a ten years' contract, and the Cromer Gas Company a seven years' contract—both in competition. But such contracts pale before the hundred years' contract secured in Boston (U.S.A.) for some ten thousand gas-lamps. The Tottenham Light, Heat, and Power Company were able to make contracts with the local authorities at lower rates, owing to the savings effected by the use of automatic lighting and extinguishing devices. Nothing definite has yet been done in connection with a street-lighting specification, but the gas interests upon the Joint Committee have been strengthened by the addition of Mr. John Bond and Mr. F. J. Bywater—Mr. S. Y. Shoubridge and Mr. Robert Watson being the other two representatives. Mr. Jacques Abady has taken part in the discussion during the year of the subject of a specification, and has suggested various clauses. Good work is expected from the National Illumination Committee which has been formed to operate in conjunction with

the International Illumination Committee. The results of the application of petrol air gas lighting at the Romford Workhouse and Infirmary have been under review during the year. The air-gas people have been making a special raid upon the poor-law institutions of the country; but the high price of petrol has been a factor against any very great additional success in the exploitation of the system.

Improving the Efficiency of Gas-Cookers.

Regarding the uses of gas other than for lighting, some promising attempts have been made to raise the heat efficiencies of gas-cookers and the top boiling-rings. In both ovens and boiling operations, it has been conclusively proved that higher efficiencies are to be obtained by revised construction. On the top-plates, there is a waste of heat by conduction, owing to the bars crossing the boiling-rings. There is no occasion for this. There is also lateral escape of heat through no provision being made to confine it, and to direct the heat from the flames on to the bottoms of the boiling vessels.

Gas-Fires.

In connection with gaseous heating, the campaign against the smoke nuisance has been continued; and it is hoped that the Departmental Committee on Smoke Abatement (whose sittings have been suspended owing to the war) will soon be able to put forward practicable recommendations which will have a wholesome effect in improving the purity of the atmosphere. We think it may be said that it has been proved to the Committee that the gas industry is a potent reformer in this direction. The agitation in our columns for a strict observance of hygienic principles in the construction of gas-fires has had very beneficial effect. It had its origin in the higher hygienic standard set by the Davis Gas-Stove Company when putting forward their "Shadowgraph" system of testing, which has been succeeded by a simple test devised by the laboratory staff of the "Lancet" in which carbon tetrachloride is the working medium. With this, the "Lancet" staff has tested the new fires of most of the makers, and has found that no products of combustion escape from beneath the canopy. This is a distinct gain to the development in public favour of the gas-fire. Another advance has been invention to secure more silent operation of fires, without detriment to their heating efficiency. A distinct innovation has been Wright's injector-ventilating fire, by the construction of which, and the use made of the products of combustion, an increased ventilation of rooms in which the fires are fixed is now realized. Mr. W. J. A. Butterfield contributed to our columns an instructive article describing the results of a study of the relation of flue ventilation to the heating efficiency of gas-fires. But all this work, and the incessant growth in popularity of the gas-fire, have caused the retail coal merchants to attempt to defend the use of wasteful smoke-producing fuel by traducing gas-fires in a senseless manner.

Gas Water-Heaters.

A considerable amount of attention has been directed during the year to the subject of water heating by gas. The system is growing extensively, both for domestic and trade purposes. In connection with water-circulating boilers, the warning has been given, in papers before technical societies, that the details of their installation must be studied in order to secure efficiency and economy, both of which are necessary to satisfaction and good repute. Another matter is the making of a good selection of circulating-boilers, for there have been placed on the market good as well as indifferent apparatus of this order, both in regard to efficiency and structural details. The cheapest as a rule are not the most efficient. One point upon which the makers have been bestowing particular consideration has been durability, which is a *sine quâ non* to maintenance on the hire system. There is also the question of the choice of water-heater for small households, where the strictest economy is essential. A hot-water circulating system is always a convenience; but, of course, there are heat losses in connection with them, which have to be paid for in the gas bill. In small houses, the gas-geyser (properly fitted) would prove more economical than the circulating-boiler; and it is found that good use is made of the geyser fitted in the bath-room, apart from its primary purpose of supplying the bath;

Gas Heating and Power in Industry.

There is no question that gas—both high and low pressure—is making good headway now in industry for heating furnaces, muffles, crucibles, &c. A wealth of possibility lies in this direction, as was seen by the paper read by Mr. H. M. Thornton at Newcastle-on-Tyne, in which a survey was made of numerous applications. The makers of industrial gas-heating appliances have obtained a larger experience of requirements, and have made considerable improvements. Everything promises for an enormous future. Indication of this is found in the annual report from the Royal Mint, in which it was seen, among other things, that the melting of nickel bronze bars in 1913 by the gas system resulted in a saving of 27·3 per cent. of the total charge in 1909, when coke only was employed. In all other branches of metal melting, an increased efficiency was also shown. At the University of Sheffield, some extensive experiments have presented a *primâ facie* case for the use of gas as a fuel. In melting non-ferrous metals, the cost of gas per 100 lbs. melted was much less than for coke. Mr. Ralph Halkett sent us some particulars of an installation of furnaces, which gave their owners a saving of £269 a year. Attention has also been drawn during the year to the heating by gas of bakers' and biscuit-making ovens. Two things are more especially required in this work—first getting into immediate touch with manufacturers, learning their requirements, and prescribing what is most suitable; and, secondly, applying the right principles, as to which Mr. L. E. Tooth gave some information in his lectures at the Westminster Technical Institute. Consideration has also been given to the firing of steam-boilers by gas; this especially by our Canadian friends. More has been heard of the surface combustion system, through the lecture of Professor W. A. Bone at the Royal Institution, and the Howard lectures he delivered at the Royal Society of Arts. There was an attempt in Germany to link together the names of Bone and Schnabel as inventors; but against this Professor Bone naturally made protest. A trenchant criticism of the system appeared in our columns from the pen of Mr. H. H. Gray.

In connection with power, there have not been any new developments to specially chronicle. But there has been insistance upon the importance of periodical testing and adjusting of engines so as to maintain their efficiency. In an account of work of this kind done in the district of the South Metropolitan Gas Company, Mr. W. A. Tookey explained to the Institution of Mechanical Engineers how he had found that simple adjustment, repair, and renewal of parts greatly increased efficiency in many cases. By mere adjustment of the gas and air supplies, for instance, he had found it possible to effect improvements in 66 per cent. of the engines. To the utilization of gas for generating electricity on gas-works and elsewhere, prominence has also been given; and a special article, by Mr. H. C. Widlake, has appeared on the provision of current by gas-driven sets for cinema theatres.

On the Works.

A factor that has contributed more than one can estimate to the prosperity of the gas industry of late years has been the higher standards of manufacturing efficiency on gas-works. We have heard a great deal about this during the year through various presidential addresses—particularly that of Mr. J. G. Newbigging to the Manchester Institution, and that of Mr. Thomas Glover to the Southern Association. This higher standard of working efficiency has raised the profitable employment of every ton of coal, has put plant to better use, has reduced the working expenses per 1000 cubic feet of gas produced, has lowered the ratio of capital to work done, and thus the capital charges. The gas engineer is still looking around for fresh seats of economy and improved results. In the matter of production, it was seen by the last-issued Board of Trade returns relating to statutory gas undertakings that in 1912-13 the average make of gas per ton of coal carbonized for the whole of the United Kingdom was 11,733 cubic feet per ton. Last year London alone claimed an average yield of 12,400 cubic feet per ton. There are individual cases of much higher makes in the country; but when one gets to the region of 14,000 cubic feet per ton, then one would like to see an analysis of the gas to learn something as to the inert constituents. As already seen when dealing with residual products, work is also being

actively done in many places to improve the character of coke and tar, and the yield of sulphate of ammonia. Prospects are altogether technically good. But it is a bold ambition that Mr. J. G. Newbigging entertains as crystalized in these words from his Presidential Address: "I am sanguine enough to believe that large undertakings adopting continuously working vertical retorts on a considerable scale, and with normal coal and residual markets, have a reasonable prospect in some cases of balancing the cost of coal and manufacturing charges with the returns from residuals—in other words, putting the gas into the holder for nothing." At the moment, these hopes seem to be beyond realization. In normal times the last few pence still outstanding will be, under the best of working conditions, difficult to bridge, as coal is likely to be always dearer now, and competition in, and increased output of, residuals will restrain the upward movement of prices. But anything like a near approach to the happy conditions pictured by Mr. Newbigging will not be realized where conditions exist such as were found at Blackburn by Sir Corbet Woodall, or at Leeds by the new General Manager (Mr. W. B. Leech). In some—fortunately, we believe, very few—cases, the year's history shows, the view is entertained that what exists in works is good enough without reference to any improvements; and even, in these days of extended mechanical operation, the economic importance of proper repair and maintenance is too often neglected.

There have been plenty of opportunities this year of inspecting gas-works with modernized plant or extensions on modern lines; and new carbonization plant, with coal handling on up-to-date systems, and telpher plant for dealing with coke, have been described—electrical operation being in the ascendant. In fact, in connection with coke transport, it may almost be said that the death-knell of the old forms of coke-conveyor has been sounded in favour of the telpher, which allows of the lifting and the carrying of coke, and so reducing breeze to the minimum. In association with the telpher, the favourite system is, with both vertical and horizontal retorts, to eject the spent charges direct into large skips, running on trolleys, and to lift the skips from the trolleys and carry them away direct to their destination—for screening and overhead storage, or to the coke heap, railway truck, or to the producer-floor of vertical settings, or still higher for the first charging of continuous verticals after scurfing. The elasticity of the telpher is great, and the maintenance costs low. Experience has improved the structural design. For example, the number of standards, it has been shown, should be reduced as much as possible on the coke-ground, in favour of long lattice girders, so as to bring to a minimum the number of standards buried in the coke. Corrosion and impediments are thus diminished.

Carbonizing Plant and Kindred Topics.

The intermittent system of vertical retorts, the two continuous ones, and the intermittent-continuous system (which hails from Glasgow) have all made progress in installation this year; in fact, some considerable capacity plants have been erected. The applicability of vertical retorts to small works has also been further demonstrated. But large vertical retort adoption notwithstanding, the adherents to horizontal retorts, and to the more modern systems of their charging and discharging, are numerous; and some wonderfully good work is being done with, among other types, the De Brouwer and the Fiddes-Aldridge machines. The latter machine has had its chain enlarged in order to deal with the requirement of nearly full horizontal retorts (at Liverpool the chain is able to negotiate a 16 cwt. charge), with which nearly full retorts results that vie with those of the vertical ones are now being obtained, though there are collateral advantages of the vertical system which cannot be overlooked. Illustrating the progress made in carbonizing methods, the following comparative working costs have been published for the plants at the Rochdale Road works at Manchester: With compressed-air machines on both sides of the bench, the working costs, including labour from coal to retorts and coke to yard, 29·3d. per ton of coal carbonized; and with discharging and charging from one side of the bench only 15·26d. It was estimated that, with the 4 million continuous vertical retort installation, which supersedes a retort-house in which only 2 to 2½ million cubic feet of gas per day could be produced—the estimate being based on experience with a smaller installation—working costs would be below the last-named figure. Several illustrated articles describing new installations of plant have appeared during the year.

At their own request, the Carbonization Committee of the Institution of Gas Engineers sought dissolution; finding they were having a somewhat useless existence, and they were quietly relieved of their duties. The Refractory Materials Committee, however, continued their useful work; and in their annual report they gave some valuable information as to the employment of 95 per cent. silica material in America. At Sheffield, however, Mr. J. W. Morrison has found that 85 per cent. silica is preferable to the 95 per cent. Dr. J. W. Mellor is at work on the lime compounds of refractory material. The general subject of refractory materials was dealt with by the same gentleman in a lecture delivered before the Manchester District Junior Association; and Mr. Thomas Holgate has contributed a series of articles to our columns, under the same heading. The corrosion of retort materials by salt has been a live subject; and Dr. Alfred B. Searle, in our issue for Dec. 8, showed how varied are the influences which contribute to the effects. The subject is worth special study; and more particularly when a contractor for retort-benches—such as the Chairman of the Society of British Gas Industries, Mr. J. W. Broadhead—suggests that, before life guarantee is given for retorts, there should be some knowledge as to the sodium chloride content of the coals usually carbonized, which rather raises a difficulty. Passing from this matter, a startling statement has been made, regarding the benefit of the application of the Brooke air-regulator in connection with retort-benches, by Dr. W. B. Davidson, to the effect that, at one gas-works of the Birmingham Corporation, the fuel was reduced by their use from 25,000 to 16,000 tons per annum, representing a saving of about £5000 a year. An account of researches by Messrs. Burgess and Vernon Wheeler on the distillation of coal in vacuum has been published. The heating of retort-settings has been discussed; and several improvements in detail have been noticed which facilitate working—in one respect, in connection with the scurfing of retorts. Among the attempts to raise economy by utilizing waste has been the introduction in retort-settings in America of waste-gas boilers for the purpose of raising steam. The "Works Topics" notes which appear in our pages, we are pleased to find, have continued to be a source of lively interest to our technical readers.

Complete Gasification of Coal, Coke-Oven Plant, and Low-Temperature Carbonization.

Some time ago the complete gasification of coal for gas production was advocated by Strache; and Mr. C. B. Tully has introduced a plant of the twin-generator type for the purpose for application in small works. In this he produces a high quality of coal gas and water gas in one operation. A descriptive account of the plant was published by us in the course of the year, together with some criticism as to the results.

Increasing attention has been paid to the subject of coke-oven plant, and the utilization of the gas for town purposes. What is being done at Birmingham, Darwen, and elsewhere has evoked a much wider interest than has been previously shown. The pressure of increasing coke stocks and sluggish demand has caused recognition of the fact that coke must be produced which will meet local requirements; and where there is a market for metallurgical coke, there it is worth while considering a coke-oven plant. There seems to be some profit in it. Mr. Purves, in the Institution paper already referred to, stated that, in Glasgow during the year ending May 13, 1913, the value of coke-oven coke was higher by 7s. than gas-works coke. Mr. E. W. Smith, too, in a paper before the Midland Section of the Society of Chemical Industry, stated that the superior coke produced by the Birmingham plant realized from 2s. 6d. to 4s. per ton more than retort coke. Incidentally, too, he also pointed to the reduction of labour costs; mentioned that with outside producers the fuel consumption was expected to be about 14 per cent. of the weight of the raw coal carbonized; while it was anticipated that the yield of sulphate would be 90 lbs. per ton of fuel gasified in the producers. From these Koppers chamber ovens, too, the sulphur content of the gas, other than sulphuretted hydrogen, was lower by 20 per cent. than from retort gas. There is little doubt that large quantities of coke-oven gas will in future be absorbed by the town-gas industry. What is being done at Middlesbrough will be watched with the keenest interest. From the

"Otto" ovens of Sir W. B. Samuelson and Co., Limited, the Corporation is being supplied with crude gas at, it is understood, 4d. per 1000 cubic feet; and this is said to be for the supplying firm on a profit-paying basis. The gas was turned on from the coke-ovens to the town for the first time on Oct. 15.

The low-temperature carbonization of coal has aroused interest at intervals in the course of the twelve months. The provision of home motor fuels has been principally responsible for this. The Coalite system has been resuscitated. It has had a chequered career; and much money has been sunk in connection with it. The Barnsley Smokeless Fuel Company, Limited, has been registered with a capital of £95,000 to carry on the business of manufacturers of fuel, and to adopt an agreement with the British Coalite Company to work the first low-temperature carbonization plant in the Yorkshire coalfields. This is the beginning and the end of the intelligence regarding the Coalite system this year. It is said that the plant has been improved, and that it is hoped it will be adopted by various collieries—if the public will accept a smokeless solid fuel, which will be subject to the severe competition of coal and improved coke, as well as gaseous fuel. From the Coalite Company there was issued a warning against the production of smokeless fuel by carbonizing at low temperature, and actions for infringement were threatened. It has, however, been pointed out that the Comptroller-General of Patents, in connection with the opposition to the grant of a patent to Walter Dixon, stated that there could be no general claim for a patent for the production of a smokeless fuel by the distillation of coal at a low temperature. The Glasgow Gas Committee have decided to instal a trial plant for carbonizing coal at a low temperature, to produce a smokeless fuel—a fuel containing rather more volatile matter than ordinary retort coke. It is hoped that we shall hear something more of this experiment. Another revival during the year was the Del Monte system; but those who are exploiting this process have abandoned the idea of the speculative production of a smokeless fuel, and are now proposing to make motor spirit and fuel oil the primary products, and sulphate of ammonia the secondary one. Mr. W. J. A. Butterfield reported favourably on the technical and financial aspects of the plant, employing cannel, which, he held, would be more profitable than ordinary coal. He prepared a scheme for a 500-ton plant, to cost £185,000; and this plant, at the market prices taken for the products, it was computed would make a profit of £112,894 a year, by carbonizing 180,000 tons of cannel, and working the plant at full pressure 360 days out of the 365. There followed the prospectus of the British Isles Oil Producers, Limited. The capital proposed was a million sterling—the first issue being £400,000, of which 75 per cent. was asked from the public. With the issue of the prospectus, the curtain dropped; and now there must be patient waiting for the next piece of Del Monte intelligence. With the fall (true at present only slight) in the price of petrol, with the large consignments to this country even since the war started, combined with the changed circumstances of the residuals markets, especially the outlook regarding sulphate of ammonia, we fear for the realization of the net profit—if the 500-ton per day plant is being erected.

Water Gas.

There is not much to be said as to water gas. The lower price of oil under contract and the condition of the coke market have caused a larger use of plants than was the case in the early part of 1913. With current greater yields of gas per ton of coal carbonized, and when the residuals markets are normal—a condition in which they have not been now for some time—the position of carburetted water gas is further affected. The coke market, however, is an important factor to-day; and so is the basing of the standard quality of gas on the calorific power. In consequence of these conditions, there is some inclination to give more consideration to the making of blue water gas, or a lower quality carburetted water gas, and a proportionately higher grade coal gas. It is calculated that from 15 per cent. to 30 per cent. of blue water gas having a calorific value of 300 B.Th.U. can be added to any good quality coal gas, and yet comply with the standard of 540 B.Th.U. Gas oil having to compete with a larger production of coal gas per ton, it is for the oil suppliers to see that their prices are not above the intrinsic value for gas-making purposes. Among notable events of the year, the Paris Municipality agreed to the supply of carburetted water gas in the city.

In connection with the war, an Order in Council created some confusion as to whether, for safety purposes, it was intended that protective walls or embankments, to prevent the escape of oil in the event of any untoward circumstance, would have to be erected round oil-tanks on gas-works. But a subsequent Order explicitly attached the regulation to petroleum and spirits, stored in excess of 100 gallons, having a flash-point below 150° Fahr. (Abel test). This exempts most gas oils; but, to save trouble, it would be well to have tests made to see that the oil really has a flash-point above 150° Fahr.

Following Carbonization to Purification.

Perhaps succeeding carbonization the most novel introduction for gas-works purposes (though not new in coke-oven practice) has been the installation of a turbo-exhauster at the Windsor Street Gas-Works of the Birmingham Corporation. An article on the subject, from the pen of the Engineer of the works (Mr. John Foster), appeared in our columns on Feb. 10. Among good points of the machine are that it is robust, free from vibration, and is noiseless; the steam consumption is well within the guarantee at any load; there is a substantial saving in lubricating oil; the ground space occupied by it is small; and it is anticipated that the upkeep is not likely to be considerable. In every way, Mr. Foster reported highly as to the efficiency of the machine. In presidential addresses and papers, those (in discussion) hitherto much-neglected items of gas-works processes—condensing, washing, and scrubbing—received quite a respectable amount of attention. More information also came from America regarding research work into the electrical removal of tar.

Technically, the decided feature of the year, however, has been the information given as to the extensive application of the heat-purification system to the manufacturing processes of the South Metropolitan Gas Company—the system as developed by Mr. E. V. Evans, with the assistance of the Chairman (Mr. Charles Carpenter, D.Sc.), and Mr. C. F. Franks in connection with the engineering details, and suggestion from the Company's Chief Engineer (Mr. W. Doig Gibb). Taking the topmost place in the technical features of the Liverpool meeting of the Institution was the masterly lecture on the history (largely composed of failure) of heat purification up to the time of, and including the discoveries made by the insistent perseverance of Mr. Evans and his collaborators of the requirements to the attaining of success, the chief of which were the employment as catalyst of a porous fireclay impregnated with reduced nickel, and the preheating of the gas. The decomposition of the sulphur compounds and their conversion into sulphuretted hydrogen are effected to such an extent that the residual sulphur only amounts to 7 or 8 grains; and of this, Mr. Evans stated in his reply to a discussion on a paper he read at the Society of Chemical Industry, some 60 per cent. is thiophene. The Company have now three plants—the largest at East Greenwich being equal to 15 million cubic feet per day. The working cost of the system, including 10 per cent. for depreciation, interest, &c., is only 0·299d. per 1000 cubic feet. Of course, additional oxide purifiers are required for removing the sulphuretted hydrogen. This reference to the heat purification system reminds of the contribution made by Dr. Rudolf Lessing to the subject of catalysis, through his "William Young Memorial Lecture" at the North British Association meeting, and that of Professor Sabatier. Our French friends have continued to closely interest themselves in processes for the removal of carbon bisulphide from gas.

Importance of the Laboratory—The Standard Calorimeter.

The man who deals in grains in the laboratory is important to the man who deals in tons on the works. The development of the heat purification system is a case in point. The laboratory takes a larger part than before in gas-works developments and control. More attention than ever has been called during the year to the necessity of maintaining gas of as uniform a quality and composition as possible, and to keeping the inert constituents down to the minimum point. The South Metropolitan Company particularly have been at great pains in realizing and maintaining a supply of gas of standard quality—a gas as constant in composition

and quality as possible. Under these circumstances, control in the shape of a frequent analysis of the gas in the laboratory is necessary. The importance of the chemical department on all gas-works—not only in regard to gas, but to material and products of all kinds—is growing in both recognition and the character of the work done; and witnesses of this are the numerous articles dealing with chemical apparatus and processes that have appeared in our columns during the year.

Touching the laboratory, the Boys calorimeter was in the course of the year charged with giving results 2 per cent. lower than the Junkers. This was by two American investigators—Messrs. C. W. Waidner and E. F. Mueller. Their conclusions were challenged in the "JOURNAL;" and further investigations were made by the latter gentleman, and his findings were embodied in an article that was published in our columns. This article demonstrated that, as he used the Boys calorimeter, it did give low results. He did not, however, show that it gave low results when used in the manner prescribed by the Metropolitan Gas Referees. At the same time, it was admitted by us that as now the calorific test to be followed in this country must give the total heat value of the gas, it was desirable that the limitations of the Boys calorimeter should be recognized, and that it should be discarded unless further evidence was forthcoming that it did give the total heat value through all the variations and conditions of testing likely to arise.

GASHOLDERS.

In connection with gasholders, there has not been much to report this year. We have fortunately had no serious accidents to chronicle, notwithstanding high gales. The Ilkeston trouble is almost a memory now, although its lessons, it is hoped, will serve to prevent any similar occurrence due to the same cause. The holder was reconstructed in a brick and puddle tank, and again brought into service during the year. There has been conference between representatives of the Institution of Gas Engineers and the Gasholder Section of the Society of British Gas Industries on the subject of the gauge of gasholder plates, &c.; and the result is that a new clause has been added to the standard contract clauses. Perhaps the most notable matter in connection with gasholders was the securing of the contract for a large holder at Tottenham by a German firm. War intervened; and no determination, so far as we are aware, has yet been arrived at as to what is to be the constructional fate of the holder.

DISTRIBUTION—PRESSURES, &C.

Distribution continues to engage considerable attention as a topic for discussion, owing to the larger drafts upon the canalization, the wider area of distribution, and the greater necessity for maintaining equality of pressure under the diverse conditions of consumption. The German Association have been making an inquiry into the effect of pressures in relation to consumers. The advantages of higher pressures they found were generally reduction of fluctuation, greater capacity of mains and services, and increased economy. The disadvantages were increased loss of gas, and (with the present types of burners) a loss of efficiency above, but an increase up to, 4 inches. To raise the pressure above 4 inches for lighting purposes would therefore require some specially designed burners. With boiling-rings and a considerable increase of pressure, it would be necessary not merely to change the nipples, but to alter the construction of the rings, or the size of the vessels used. In connection with steel pipes, the welded joint grows in favour. Some amount of indignation was aroused owing to the treatment of the Tredegar District Council by the Local Government Board in regard to a loan, part of which was required for steel mains. The loan was granted on condition that no payment was made out of it in respect of steel pipes. The explanation that came after some delay was that the Board had granted a repayment period of thirty years, which was the period allowed for cast-iron mains; while the longest period the Board would grant for untapped steel mains was twenty years, and for tapped ones fifteen years. High-pressure meters came in for some amount of publicity this year, owing to several local authorities—the London County Council, the City Corporation, Edinburgh, Manchester, &c.—believing the time had arrived when such meters should be tested and certified before use. The City Corporation and the London County Council promoted legislation for the purpose in Parliament last session; and, by negotiation over details and the time when the legislation should be made effective in regard to existing meters, the proposals passed into law.

TECHNICAL INSTITUTIONS, INVESTIGATION, AND EDUCATIONAL WORK.

Since the beginning of the war, there has been a lapse in the technical work of some of the District Associations. This has not been so in all cases; nor with the junior organizations. "Business as usual" has been their motto. Up to the meetings of the North British and Irish Associations, things pursued their normal way. The central feature of the year, of course, was the meeting of the Institution in Liverpool, under the presidency of Mr. Edward Allen. An extraordinarily good time was spent there, through mainly the generous reception by the Chairman (Mr. H. Wade Deacon, J.P.) and Directors of the Gas Company, and by the Lord Mayor (the Rt. Hon. Herbert R. Rathbone), supplemented by the assistance given by our several friends of the Chester Gas Company on the visit paid to that historic city. Technically, the feature of the meeting, as already stated, was the lecture by Mr. Charles Carpenter, D.Sc. There was disappointment that the papers did not offer anything else in the way of gas engineering. The nearest approach was Mr. Purves' paper on the application of coke-oven carbonization and the "Otto" direct ammonia recovery system to gas-works requirements. Mr. B. Schieldorp, of Bergen, gave some interesting particulars of various matters affecting the gas industry in Norway; Mr. Jacques Abady dealt with the subject of calorific power as a standard; and a valuable contribution was that of Mr. John West recounting practical experience in the use of sulphate of ammonia as a fertilizer. There was little time for the discussion of these communications; and the plea for reform in the procedure at the annual meetings has again been raised. The Department of the Leeds University over which Professor J. W. Cobb (Livesey Professor) so ably presides was quite a prolific contributor to the proceedings. Jointly with Professor Cobb, Mr. Hollings, B.Sc., reported on subjects in which there is room for investigation—as to the temperature changes which occur during the distillation of coal, and the heat absorbed or evolved during the process, as well as the influence of incandescent surfaces and radiant heat on the decomposition of ammonia. There was also a report by Mr. William Harrison on ventilation problems, into which research is being made. Mr. Harold Hartley, M.Sc., gave an account of the work that he did, under the first Livesey Professor (Professor W. A. Bone) on the electrical condition of gold and silver surfaces during the absorption of gases and their catalytic combustion. A Gas Heating Advisory Committee has been formed by the Institution and representatives at the Leeds University. Allusion to the report presented by the Refractory Materials Committee has been made elsewhere. With regard to the proposal for central industrial representation, a scheme was evolved by the Joint Committee consisting of representatives of the Institution, the Society of British Gas Industries, and the British Commercial Gas Association, and was submitted to the three bodies. The scheme, however, has been shelved for a time, but not a few hope for its revival. The Council of the Institution have decided to begin to "save up" for the provision of a suitable home for itself, and have allocated £500 to the purpose.

The proceedings of the technical organizations abroad contributed much interesting information to our columns. The Society of British Gas Industries held a couple of interesting meetings, at the first of which the retiring President (Professor Harold B. Dixon, F.R.S.) discoursed on flames; and at the second, the Chairman of the Council (Mr. J. W. Broadhead) gave as a contractor to the industry the benefit of his views on various subjects. Sir Alfred Keogh, K.C.B., LL.D., M.D., is the new President; but as his services have been required in connection with the war, presence was impossible at the second meeting of the year. The members therefore invited him, and he has consented, to serve them as President for another year. The Society of Illuminating Engineers have continued their useful work in connection with illumination topics.

Educational matters have occupied attention in many quarters. The industry wants well trained and educated young men; but Mr. F. J. Bywater has, during the year, publicly stated his views as to the gas industry having no

adequate educational scheme for guidance in producing what is required. While this is so, the higher education provided by the Department of Coal Gas and Fuel Industries of the Leeds University is not being taken advantage of so quickly as could be desired. The research work is, however, extending in its usefulness to the industry. A generous act, which will commemorate his presidency of the Institution in the Jubilee year, has been performed by Sir Corbet Woodall, in founding a travelling studentship in the technical university departments of our own country, or else a scholarship at one of the Continental universities, of £50 a year. The reports of the Examiners in Gas Engineering (Mr. Thomas Glover) and Gas Supply (Mr. Walter Hole), in connection with the City and Guilds of London Institute, showed a healthy and gratifying condition of things. Mr. Samuel Glover has been appointed to the examinership in gas engineering. The scheme for the education of gas-fitters was advanced; so that the first examinations can take place next year. The Examiners are Mr. H. Kendrick and Mr. R. Halkett. An indication of the subjects under which examinations will take place appeared in our columns.

Changing the Course of Gas Legislation.

The parliamentary session was an important one—in fact, an epoch-making one—in the history of British gas supply. Even so, it is not intended to occupy much space here in reviewing what was done, inasmuch as a general survey of the session's work was made in our editorial columns on Sept. 22 and 29, and Oct. 20. Sufficient must be a brief reference to the salient features. At head and front stands the definite work accomplished in respect of the suppression of the illuminating power standard, and the establishing of the terms of the calorific value standard and test. The Gas Light and Coke Company's Bill was the one over which there was long and full argument; most of the other promoters having agreed to abide by the decision arrived at in the "test case." The result was that the illuminating power standard was discarded; and the calorific value standard was established as the one that the Private Bill Authorities will henceforth look for in Gas Bills. This is indicated by the new Model Clauses. From these those grey and hoary ones referring to illuminating power have disappeared; and the calorific one is now inserted on the lines of the new provisions applying to the Gas Light and Coke Company. Special circumstances will no doubt receive the consideration of both the Parliamentary Authorities and Select Committees when variation is desired. The terms of the Gas Light Company's clauses (and of the Model Clause) are: Standard 540 B.Th.U. gross, with a margin of 7½ per cent. below before penalties begin to accrue, making the penalty line 499½ B.Th.U. gross; and, in the event of a lapse of more than 5 per cent. below the standard on the first test, the average of two tests in the day is to be taken as the calorific power. The gas is to be tested so that the "total heat" value is realized. That variations under special circumstances are permissible is seen by the Liverpool Company's Act, in which, under their prior condition of high illuminating power, a calorific value of 550 B.Th.U. was imposed with only a 5 per cent. margin. Again in the Bedwas and Machen Act and the Porthcawl Act, the promoters satisfied Parliament that, under the circumstances of the available quality of their coal supplies a margin of 12 per cent. should be allowed. Other promoters during the past session, generally speaking, accepted the Gas Light terms. Notwithstanding this, there are people who are still searching for an absolutely correct standard—for example, Mr. J. H. Fairweather, F.C.S., as articles and controversy in our columns have shown.

The Alkali Manufacturers' Association made a reappearance last session on the South Suburban Gas Company's Bill and the Swansea Company's Provisional Order, and secured from certain Committees, in defiance of the Joint Committee's findings, a restriction of residuals purchasing powers to one-third. The decision is a most unjust one, and has been severely criticized not only in these columns, but by Mr. Charles Hunt (at the South Suburban Company's meeting) and others. What is still more unjust is that the Private Bill Authorities have incorporated—flouting completely the Joint Committee's recommendation—the one-third restriction in the new Model Clauses. Our advice to promoters is to contest this violation of a fairly-won confirmation of a correct principle, and to maintain the right to the possession of the fullest trading liberties in the residual products markets, in order to ensure open competition. One result of this renewed attack is that consideration has been given (and the matter is not going to be lost sight of) to the question of establishing sulphuric acid making plants by large gas undertakings, and further a proposal as to the feasibility of forming an independent company, capitalized by gas stockholders, to make sulphuric acid for gas undertakings, has also been introduced. There are more ways than one of making effective reply to injustice of the order that was perpetrated in the past session.

Notable among other matters was the securing of large site powers by the South Suburban Company on the banks of the Thames at Belvedere. The Brentford Gas Company did not carry through their projected new works site, but they secured other valuable powers. Various concerns extended their operations by purchasing their smaller neighbours; but, in connection with area extensions, promoters were generally limited to a period within which they may commence to exercise the powers. Failing this, at the end of the period, the powers may be transferred without opposition. Certain additional gas companies obtained electricity supply authorization. Remarked, too, was the persistence of certain county councils and railway companies to gain exceptional protective powers. Comment was made on this point in our editorial columns on Sept. 29. The City Corporation and the London County Council, with certain modifications, carried their application for powers regarding the testing and certification of high-pressure meters. Speaking of pressures, in certain instances, the old minimum of 8-10ths for distribution purposes was raised—in three cases respectively to 12-10ths, 15-10ths, and 20-10ths. The Gas Companies' Protection Association continued their effective watching over legislative questions, and took active part where possible. Of the Association, Sir Fortescue Flannery, Bart., M.P., is the new President; and, at the annual meeting, both he and Mr. H. E. Jones, the Chairman, pleaded for a more extended support by gas companies of the valuable work of the Association.

In the Law Courts.

There has been quite a considerable number of cases in the Courts referring to minor matters in which gas undertakings or manufacturing firms have been concerned—among them compensation ones. We must, however, pass them over and confine attention to the litigation that has larger concern for the industry. Outstanding is the Long Eaton case, in which, at the instance of the Gas Company, the District Council were called upon to answer the charge of acting *ultra vires* in allowing undue preference to electric power consumers who were also lighting consumers to the detriment of those electric power consumers (no matter the extent or profitableness of their power custom) who preferred to use gas for lighting. Mr. Justice Sargant's judgment was a considered one, and on every point his conclusion was against the District Council. Singularly enough, in face of the judgment, the District Council were advised, and determined, to appeal. But after the Master of the Rolls and Lords Justices Kennedy and Swinfen Eady had heard a laboured argument from Mr. Vesey Knox, K.C., they showed their unanimous opinion regarding the whole matter by at once dismissing the appeal without calling upon the respondents. There was some talk of going to the House of Lords; but wiser counsels prevailed. This "undue preference" question has bulked largely during the year. While the Long Eaton case was pending, the Ilford Gas Company commenced an action against the District Council, in which the point of preferential charges was raised, as well as the further one alleging that the Council are spending money, without statutory authority, in supplying electrical fittings and apparatus. The Ilford Council at one time were disposed to resist; and there was an attempt at a "whip-round" to raise funds for defending the action. However, since Long Eaton, it seems to be accepted that one of the charges is governed by the decision in that case, while on the other point there is a prospect of a settlement. If not, it is expected that Mr. Justice Sargant will take the case on Jan. 12. Meantime, too, the South London Electric Supply Corporation brought themselves within the pale of the law by offering, irrespective of demand, a preferential price of 5d. per unit to householders who used electricity wholly for lighting, as compared with 5½d. to householders who partly used electricity and partly gas or other illuminant. The South Metropolitan Gas Company served the

Supply Corporation with a writ. The case came before the High Court; but by that time the Electric Supply Corporation had withdrawn the offer. This is not the only instance in which the Long Eaton litigation has had the wholesome effect of bringing to their senses electricity suppliers in regard to the preferential price question.

The gas distribution department has been largely in the Law Courts during the year. The Commercial Gas Company were the defendants in an interesting action, in which damages were claimed by a couple of people who had tripped over an uneven paving-stone beneath which the Company had been doing work. Under the Metropolis Management Act, 1855, the Poplar Borough Council elected to do the work of restoration of road and pavement surfaces after pipe or cable laying. The accident in question did not occur until several days after the Company had given the Council notice that their part of the work had been completed. The Company contended that the length of the delay of the Council in doing their part was unreasonable; and therefore the Company were not liable. The Bow County Court Judge held otherwise; and his view was confirmed by the Divisional Court before whom the case came. The Company, holding the opinion that the issue was one of considerable importance to the owners of property beneath roadways, offered to bear the costs of carrying the matter to the Higher Court; but leave to appeal was refused. A difference arose between the Harpenden Gas Company and the District Council as to a plan for pipe laying in a certain road. The Council declined to give their approval; and the St. Albans County Magistrates were invited to adjudicate between them. The result was the approval of the Company's scheme. During 1913, Mr. Justice Eve decided that a 2-inch pipe, 264 feet long, running from a main of the Chesterfield Gas and Water Board up a side street in the area of the Whittington Gas Company was a "service-pipe" and not a "main." The Court of Appeal last May upheld this view. An interesting case now awaiting trial, unless otherwise settled, is one in which the Gaslight and Coke Company seek to restrain the Woodford and Wanstead District Councils from using reinforced concrete for the foundations of certain roadways. The matter has already been mentioned in Court two or three times.

Tripping over a depression in a pavement under which the Eastbourne Gas Company had laid a pipe, a man named Adams sustained injuries, for which the Company were ordered at the County Court to pay £30. In connection with a prepayment installation, a pipe projecting into a room, uncapped and without a fitting attached, led to an explosion, which caused a new tenant injuries, for which the Redcar Gas Company had to pay £50 damages. In a case before Justices Bray, Avory, and Atkin, it was decided that a "steam-roller" is a "locomotive." The question arose in connection with a case in which the Hampshire Justices had refused to convict the owners of a steam-roller for not having the weight displayed, as required by the Act of 1861, section 12. A case in which the Swansea Gas Company and the Swansea Rural District Council were concerned related to a difference between the parties regarding an agreement for the supply of gas to, and the lighting of, certain areas. The facts are too extensive to enter into here, but the Council gained the day. It was an "inglorious victory" for them. The appeal failed of the Conway Corporation against the injunction granted to restrain them from committing a nuisance from their gas-works; and the question of abating it had to be taken in hand.

Warnings notwithstanding, the Manchester Corporation Gas Department have had much trouble in their area over the use of discs in prepayment meters. Looking through the "Legal Intelligence" index for the year, it will be seen that the matter has been three or four times before the City Police Court and Quarter Sessions. The Corporation were unsuccessful in preferring charges under the Larceny Act, and of obtaining credit by fraud under the Debtors' Act. But they obtained a conviction under section 68 of the Gas-Works Clauses Act for fraudulently abstracting gas from a prepayment meter. One of the London Magistrates has been using rather extravagant language about prepayment gas-meters manufacturing thieves; and he has in consequence been criticized. Prepayment meters have no part in the manufacturing of criminals. Vice must be already there; and the meter is the object on which the vice is exercised. A serious charge of embezzlement on the part of gas officials has been heard at Walton-on-Thames; but the matter is still in abeyance.

An appeal by the Preston Gas Company against an assessment made by the Assessment Committee of the Preston Union occupied some four days at the Quarter Sessions recently; but an arrangement was then effected fixing the rateable value for the financial year 1913 at £14,000, and for the subsequent three years at £13,000—the Company also paying £350 towards the costs of the Assessment Committee. The Boston Gas Company appealed against the rating of their works; and an agreement was arrived at for £2000, against the assessment of £2300. Peculiarly interesting was a case of income-tax assessment, in which the Bishop's Stortford, Harlow, and Epping Gas Company were concerned. The local Surveyor of Taxes assessed the profits of the amalgamated Company for the year 1911-12 upon the total profits of the several Companies for the year 1910. Against this the Company appealed to the Special Commissioners. It was submitted that the conditions under which the amalgamated Company were working were dissimilar in material respects from those of the several pre-existing Companies, owing to the rearrangement of the staff and the remuneration paid to them as necessitated by the amalgamation, the reduction of the price of gas in certain areas, the laying of a connecting trunk main, and the closing of some of the manufacturing stations. The decision was in favour of the appellants. There was a further claim for allowance for depreciation—for diminished value by reason of wear and tear in respect of gasholders, meters, stoves, &c. The original assessment was £7251; and this was reduced by the Special Commissioner to £5471—the amount allowed by them for wear and tear being £928.

In the Labour World.

In the first part of the year, there was a perpetual seething in the British labour world; and a sense of insecurity generally prevailed. The trade unions were doing their best to parade a masterfulness which could not be tolerated; but their policy came up everywhere against, and was wrecked upon, the rock created by the cohesion of the masters in resisting undue demand. It was alliance against alliance; and the socialist-led unions found that their excesses could not be forced through the impregnable material met with in the union of the masters. This was seen in South Africa, where the Government showed firmness in the defence of public rights against a general strike. The leaders were clapped into prison, and were finally deported. The strikers were soon demoralized, and were glad to get back to work. It was seen again in the builders' strike in London, which continued 28 weeks, during which time the men, it is calculated, lost in wages £1,372,000, and trade union funds were paid away to the extent of some £820,000. Much misery was caused, and many industries depending upon the building trade were affected, as well as the work-people engaged in these industries. The money lost does not include that expended in voluntary aid. The whole trouble arose over the masters being sickened of the continual worry and loss experienced through strikes over petty points affecting stringently guarded trade union rule. The masters insisted on being allowed to employ men whether unionists or otherwise, and to impose a penalty of £1 per man for any breaking of agreements. The strike finally came to an end with the war; some of the unions having previously given in. It was an opportune ending, as it at once provided work, through the resumption of contracts, when otherwise there might have been a slackening of employment in the Metropolis. This at the same time benefited other trades. In January, there was also a strike of coalporters in London for 1d. per ton extra pay; some 12,000 men being affected. Here, again, cohesion among the masters was successful. Temporarily, the strike was good for the coke market. The Scotch miners unsuccessfully tried to make supposed grievances of their own a cause for a national strike. The marine engineers also had a strike in the summer, but returned to work on the declaration of war.

A campaign among municipal workers up North also ended in complete failure, owing to the firmness of the Corporations concerned. A start was made at Leeds and Blackburn, and other places were threatened; but the Unions met with (for them) disastrous failure, through the resolute attitude of the Corporations and the assistance and forbearance and help of the ratepayers concerned. To the campaign an end was soon put. There was great waste

of money, great distress, great dislocation of public services, including the gas supply, and much inconvenience; but the trades unions were disconcerted by the formidable opposition and general attitude of the public. We need not repeat the history of these disturbances; but the outcome is that municipal authorities have seen that they can resist unfair demand, though we should be sorry to see their strength used in resisting fair demand. One result of the strike at Leeds has been that a General Purposes Committee has now been appointed to take control of the labour employing departments of the Corporation in so far as the engaging and dismissal of workmen are concerned, as well as the hours and conditions of their labour. At Nottingham, there was trouble in the meter-repairing shops through the retention of three men who had been loyal to the Gas Department during the strike in 1913. But this turned out to be a short-lived affair. In some places, upon application, there was concession of gas-workers' wages; in others not. There was a strike of the gas-workers at Neath; and this occurred towards the end of the year while the war was proceeding. This fact did not reflect upon the men to their advantage. Messrs. Fletcher, Russell, and Co. were put to great inconvenience, by a strike at their works, but the differences were ultimately composed.

Turning from turmoil to peace, co-partnership continued to advance; and the reports as to its benefits come from all quarters. The statistics published exhibit a healthy financial state for the workers in gas companies operating under the principles of co-partnership. In Parliament, periodical attempts are made to further the movement, and so assist in ensuring peace. Mr. James Hope, M.P., introduced a Bill last session to promote the adoption of co-partnership by statutory and other companies; and Mr. O'Shee, M.P., introduced one providing that the Board of Trade should be empowered, on receiving a requisition signed by no less than half the employees of a statutory or other company, to appoint an arbitrator to reconstruct the company on a co-partnership basis. This proposal is too far-reaching to commend itself. The well-intentioned proposals did not get further than their introduction. During the session, the Bill of the Liverpool Gas Company was hung-up by two labour members of the House, without due authority from the employees of the Company, on the ground that considerable discontent prevailed among the men with regard to the rules and practices of the co-partnership scheme. To the satisfaction of the House, the contrary was proved to be the fact.

Retirements and Appointments.

There has been a large change in the industry's official world during the year. Several bearers of names which have for a number of years seemed almost inseparable from the undertakings served in official capacity have retired; and for many of them, after a full measure of work, we wish with all sincerity several years of leisure and happiness. Others in due season we hope to see back in the industry. Gathering together (alphabetically) the names of those who have resigned, we have Mr. Charles Armitage, of Lancaster; Mr. Thomas Bower, of Hartlepool; Mr. James Burch, of Canterbury; Mr. D. F. Colson, of Weymouth (on active service); Mr. Francis T. Cotton and Mr. W. F. Cotton, of Dublin; Mr. C. Stafford Ellery, of Bath; Mr. J. T. Foster, of Exmouth; Mr. T. C. Fuller, of Margate; Mr. John Hammond, of Eastbourne; Mr. J. R. Heath, of the Potteries Station of the British Gaslight Company; Mr. H. Hulse, of the Meadow Lane Gas-Works, Leeds; Mr. J. T. Jolliffe, of Ipswich; Mr. Mead-Robins, of Sutton; Mr. S. R. Ogden, of Blackburn; Mr. R. O. Paterson, of Cheltenham; Mr. H. C. Sims, Chief Accountant of the South Metropolitan Gas Company; and Mr. W. A. Walker, of Worthing. Some of these gentlemen have for the greater part of their working lives faithfully served the undertakings from which they have officially parted.

There has been an extensive movement among chief officials during the year; and several assistant engineerships have been under strong competition. We cannot here re-chronicle all the changes that have been made; but some of the more notable appointments may be mentioned (again taking an alphabetical course). Mr. A. P. Allan succeeded his father at Scarborough. Mr. J. E. Blundell secured the Macclesfield gas engineership. Mr. A. W. Branson was selected to follow Mr. Thomas Bower at Hartlepool. Mr. J. W. Brearley (Assistant-Manager at the Longwood Gas-Works) secured the Swinton and Mexborough appointment. Mr. T. Carmichael went from the Glasgow Gas Department as Manager of the Eastcroft Station of the Nottingham Corporation Gas Undertaking. Mr. C. H. Carder was appointed to the Oldbury vacancy. Mr. W. H. A. Chester left Middleton to take the appointment of Deputy Engineer to the Brisbane (Queensland) Gas Company. Mr. Harold Clapham obtained the position of Manager at Morecambe. Mr. Harold H. Collett took up the duties of Manager of the Meadow Lane Works at Leeds. Mr. Harold E. Copp was selected for the Engineership of the Potteries station of the British Gaslight Company. Mr. H. F. Cotton relinquished his position as Superintendent of the Public Lighting Department of the Dublin Corporation to take up the duties of District Engineer to the Gas Company. Mr. B. Grainger went from Hartlepool to enter upon the engineership of the Rhymney and Aber Valleys Gas and Water Company. Mr. William Hammond succeeded his father at Eastbourne. Mr. W. H. Johns changed from Malvern to West Bromwich. Mr. J. P. Jones, who had been with the Rhymney and Aber Valleys Gas and Water Company for about fourteen years, was appointed General Manager and Secretary of the Company. Mr. W. Langford was appointed Chief Gas Engineer to the Stoke-on-Trent Federated Council. Mr. W. B. Leech gained the management of the Leeds Corporation Gas Department in succession to (the late) Mr. R. H. Townsley. Mr. Robert J. Meiklejohn succeeded his uncle at Rugby. Mr. James Paterson took up the duties his father laid down at Cheltenham. Mr. Frank Prentice entered into possession of the engineership of the Ipswich Gas Company. Mr. William Prince obtained the Tipton appointment. Mr. W. Rogerson was selected to fill the vacancy at Middleton. Mr. S. T. Smith is now Engineer at Malvern. Mr. S. O. Stephenson has travelled south to Worthing. The much-coveted appointment at Bath—succession to Mr. Stafford Ellery—was won by Mr. J. Wesley Whimster. Mr. H. Wimhurst, the Engineer and Manager of the Sleaford Gas Company, now also occupies a seat at the Board.

Finished Work.

The Reaper's hand has been busy in our midst during the year; and the chief workers in the gas industry have had to mourn the passing from the ranks of several men of high repute and general respect. We may mention Mr. Alex. Allan, of Scarborough; Mr. T. J. Bush, the Engineer of the Australian Gas Company; Mr. John Chew, at the ripe age of 88 years, and who for more than fifty years was the Engineer of the Blackpool Gas Company; Mr. Adam Cooke, of Oldbury; Mr. Henry Hack, who retired in 1908 from the position of Chief Engineer of the Birmingham Corporation Gas Department; Mr. Stephen Holman; Mr. Edward Jones, of Burslem; Mr. Charles Meiklejohn, of Rugby; Mr. Samuel S. Mellor, of Northwich; the venerable and revered Mr. Thomas Newbigging, D.Sc.; and Mr. Edward Stears, of Lisburn. A very well-known figure in City gas circles has passed away—Mr. Thomas Guyatt; and greatly missed too by their colleagues are Mr. J. Horsley Palmer, Mr. Robert Hesketh Jones, Mr. N. E. B. Garey, and Dr. W. Statter, J.P., the Chairman of the Wakefield Gas Company. A loss to the gas and chemical industries is Herr Walther Feld. Full of honour among their French colleagues, and known and esteemed in this country by gas engineers, M. Visinet, M. Delahaye, and M. Monnier have passed from the scenes of their busy lives. Men who have occupied dignified places in manufacture and trade associated with the gas industry, and who are now at rest, are Mr. R. G. Evered, Mr. Thomas A. Greene, Mr. G. B. A. Gibbons, Alderman George Howlett, Mr. G. H. Lloyd, Mr. William Nash, Mr. Thomas Thorpe, and Mr. J. G. Watkinson. To those upon whom the grief of parting and loss has fallen heavily, much sympathy has gone from the industry.

A German Raid—Gas-Works and Other Accidents.

There have been no really notable accidents to gas-works plant during the year; but for the first time in their history British gas-works have had experience—this was on Wednesday, Dec. 16—of a real bombardment. The dastardly piece of work on the part of units of the German Navy in bombarding Hartlepool, Scarborough, and Whitby, and killing and maiming several hundred people, included an

attempted destruction of the gas-works. Fortunately, though shells fell round about the works at Scarborough and Whitby, and at Scarborough a gasholder was slightly punctured, no other harm occurred to them. The Hartlepool works were less fortunate. The Company's three gasholders were put out of action; and the gas supply failed. But speedily the Engineer (Mr. A. W. Branson) set to work to patch-up the two least damaged holders, and the supply was restored in about a couple of days. But the third holder (which will take some time to restore) had the appearance of a wreck after the Germans had done their fiendish work, and had scuttled away.

There have been several fatal accidents on gas-works during the year; but taking into consideration the extent of the industry, the number is not great. Yet we see in cases illustration of the old tale of familiarity breeding contempt; and loss of life is the result. By ordinary care, it is clear that some of the accidents might have been averted. Of gas poisonings and suffocations, there have been a few; and explosions have occurred in three or four cases with fatal results. The worst case of gas poisoning during the year was the Homerton one recorded last week, in which a husband, wife, son, and daughter lost their lives through gas escaping from a fractured street-main. Assumption that the family were away from home led to no immediate investigation of their rooms; and altogether there was little evidence at the inquest that anyone considered himself to be under any moral responsibility to test the accuracy of the assumption.

The Hope of Peace and Prosperity.

This brings us to the end of the tale of 1914. Technically, it is seen the gas industry stands well. Commercially, but for the conditions produced by the war, it would also be standing well in its gas business, though not at its best in the residuals markets. But as things are shaping—with the prospect of large industrial and trade development in the country succeeding the war, and so making still greater demands for gas, the developing work that is proceeding in connection with business in the use of coke for steam-boilers, water-heaters, and domestic purposes generally, with the prospect of larger demand for tar in the home aniline dye industry, and with the good chances of securing a large part of any additional overseas trade that will be going in sulphate of ammonia—there is very good reason for high hope for the future. The year now spent has been a black one; the prospect beyond the dark cloud of war is seemingly bright. As we stand upon the threshold of 1915, we do all fervently pray that peace may soon be restored and be so assured that this and allied and friendly countries may enter upon long years of tranquillity and prosperity.

THE GAS INDUSTRY AND THE WAR.

A page of the "Daily Mail" last Wednesday was occupied with the names of the members of the staff and workmen of the South Metropolitan Gas Company who are serving with the Forces; and in the centre, with a patriotic border, there was printed: "The South Metropolitan Gas Company, which under co-partnership has enjoyed a quarter-of-a-century of industrial peace, records with pride the fact that 32 per cent. of its staff and 21 per cent. of its workmen are serving in the defence of the Empire. Their wives, children, and dependent parents are being provided for by the Company and its Co-partners, who are undertaking much of the absent one's work. Better testimony could not be given how co-partnership principles have borne fruit in patriotic self-sacrifice. For King and Country."

A telegram through Reuter's Agency is to the effect that the Russian Government have ordered the confiscation of the Warsaw Gas-Works, which belong to a German Company. The city officials, in searching the Company's safe, found about £90,000 in gold, which had evidently been stored up to send to Germany.

The Geneva correspondent of the Paris "Temps" writes: "Recently the Swiss Gas-Works Union sent out a circular to the establishments dependent upon it, warning them that, on several occasions when coal from Germany was unloaded, unexploded shells were found in the consignments. As the result of an inquiry, it was established that similar finds have been made in five different spots in Switzerland. In a single consignment, no fewer than eight shells were discovered. The cause is believed to lie in the fact that many of the trucks in which the coal was brought had previously served for the transport of ammunition. It is possible that, in the excitement of the time, several shells may have been left in them by mistake."

The "Kentish Mercury" states that the Newcastle steamer "Elterwater," one of the three vessels lately blown up by mines off the East Coast, was laden with coal for the South Metropolitan Gas Company.

The issue of the "Proceedings of the British Acetylene and Welding Association" for December contains, among much other matter, an article in which attention is drawn to the useful part being taken by acetylene in affording light and heat to the armies in the field. The writer, referring to Napoleon's tallow candles, says "it was this dim light which illuminated despatches that won some of the most brilliant victories." Let us hope that acetylene, in its turn, will illuminate despatches that will win for the Allied Forces fighting against Germany even more brilliant victories than ever Napoleon achieved.

The death, from wounds, is announced of Captain Lionel John Neville Neville, R.E., brother of Mr. Reginald James Neville Neville, M.P., the Chairman of the Brentford Gas Company. Captain Neville, who was 36 years of age, entered the Royal Engineers in 1897. He served in South Africa from 1900 to 1902, and was present at the actions at Biddulphsberg and Wittenbergen. He was promoted Lieutenant in 1900, Captain in 1906.

At the Brighton Police Court, on Monday of last week, David Tatten, an ironmonger, was summoned "that he, being a person having control of two incandescent gas-lamps outside his shop, did offend against the Defence of the Realm (Consolidation) Regulations of 1914, by failing to comply with an order of the Secretary of State to extinguish the lights." Defendant pleaded guilty to having one light. The Chief Constable said the order was that any lights which were considered too brilliant might be ordered to be extinguished; and it had been carried out with success in every case but that of the defendant. Outside defendant's shop certain lights were seen burning, and he, at first, declined to put them out, as they were the only lights that would illuminate his shop inside. Defendant doubtless now realized the seriousness of the matter. The Mayor said it was important that these regulations should be observed. If any future cases came before them, severe penalties would probably be inflicted. The case would be adjourned *sine die* upon payment of costs.

Referring, on Monday of last week, to the manufacture of dyestuffs in this country, the "Yorkshire Observer" said: The firm of Read Holliday and Sons, Limited, the well-known chemical manufacturers of Huddersfield, will, it is now definitely stated, be the principal firm through which the Government will operate in the important scheme to be undertaken for the development of the manufacture of dyestuffs and colours in this country. It will be remembered that it is proposed to form a company with financial help from the Government. The formality of obtaining the consent of the shareholders of Read Holliday and Co. to the firm being embraced in the new company has yet to be gone through—a meeting for the purpose will be held to-morrow—but it will be nothing more than a formality. The shareholders are gratified that the firm are in a position to form practically the backbone of the Government scheme; for it is admitted that without the firm it would have been impossible to formulate plans on the present scale. An elaborate extension scheme is now in progress at Messrs. Read Holliday's works in St. Andrew's Road. The magnitude of the extensions may be gathered from the fact that 15 acres of additional land are required in order that they may be properly carried out. Three contractors, all large firms, are engaged upon the erection of buildings alone. Messrs. Read Holliday had contemplated some extensions, and these would have been carried out in any case; but it is certain that nothing so gigantic as the present scheme would have been undertaken had there been no intervention on the part of the Government. The work is being pushed forward with all possible speed; and it is hoped the extensions will be completed in August next. [See also the "Miscellaneous News" columns to-day, p. 747.]

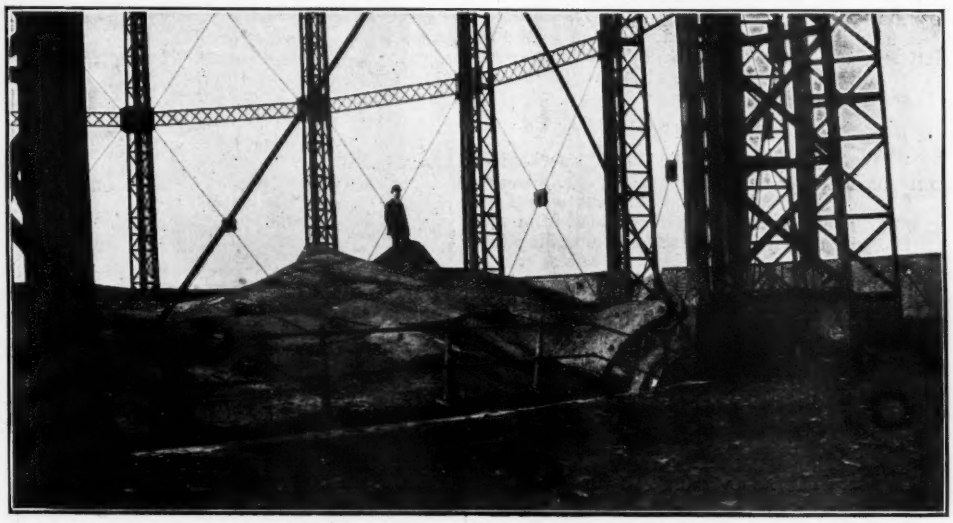
Ferro-Concrete Construction.—On Saturday, the 19th inst., Mr. R. H. Osler, of Messrs. Monchel and Partners, London, delivered in the Technical School, Rochdale, an instructive lecture on ferro-concrete construction. It was illustrated by a large number of lantern slides, which gave a very clear insight into the subject. Among them were some of the Rochdale ferro-concrete undertakings, which made the lecture all the more interesting. A number of local surveyors and builders were present.

Illuminating Engineering Education in America.—The Council of the Illuminating Engineering Society (U.S.A.) have received from the Committee on Education an extensive report (which is to be printed for distribution) dealing with the status of illuminating engineering education in the colleges of the country. The report included a summary showing the extent of instruction in laboratory work in illuminating engineering at 39 colleges, a complete curriculum for a four-year undergraduate course leading to an illuminating engineering degree, a one-year undergraduate adjunct course, a one-year post-graduate course, and a classified list of books in English pertaining to illuminating engineering.

THE BOMBARDMENT OF THE HARTLEPOOL GAS AND WATER WORKS.

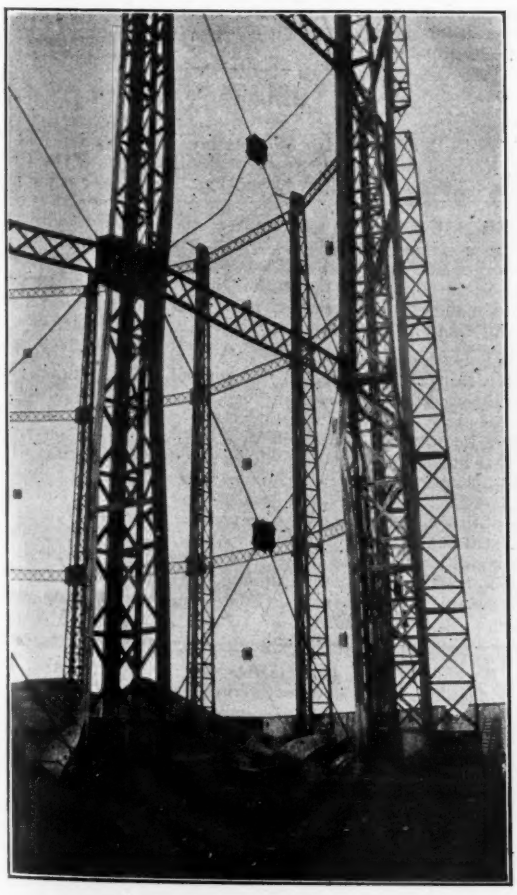
[From a Correspondent.]

Having had the privilege of visiting the Hartlepool Gas-Works and seeing the damage done by the recent bombardment by the German cruisers, I feel sure it will be interesting to your readers to have an account of the unfortunate circumstance as it appeared to me. The Press of our country have dealt very lightly with the effect the enemy's visit has had upon this unfortunate town; and it is therefore not discreet that I should deal with features other than the gas-works, except to say that no account I have seen in the papers does full justice to the terrible havoc wrought by the bombardment.



THE INJURY TO THE GASHOLDER CROWN.

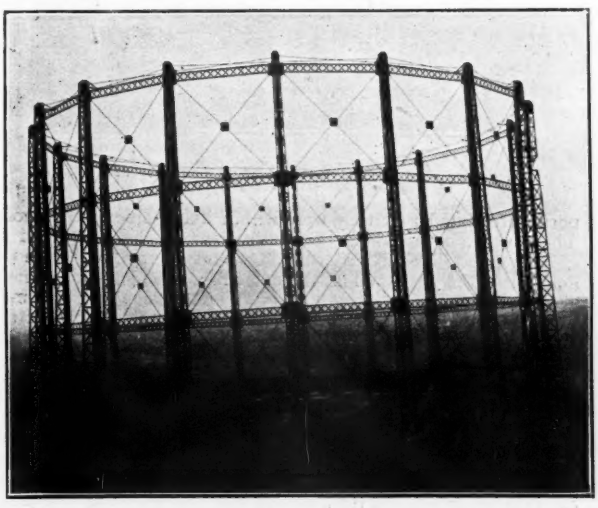
At the old Hartlepool Gas-Works, they have two large gas-holders—one of the framed type, and a three-lift spiral; while on the new site, about half-a-mile away, they have a 150-feet three-lift holder, and purifiers, sulphate apparatus, oil-tank, and water-gas plant. The latter is fitted with a small relief holder, which is the only storage plant escaping injury, and, of course, the one that might have been best spared.



The Damaged Gasholder Standards.

Damage at the Old Works.

The framed holder at the old works was damaged by a shell passing through the crown and bursting inside, so that the sides were riddled with the shrapnel, in addition to the large hole in the crown. With a promptitude that can be admired, the Engineer asked the assistance of a local steel firm to prepare him plates required to remedy the hole in the crown; and these were obtained the following day, and fixed in position. The spiral holder crown appeared to have escaped damage; but when they tried to inflate it, it was found that directly below the top curb the



The "Holder" as it Appeared after the Bombardment.

shetes were ripped so seriously as to prevent them raising it any further, until they could fix an air-lock, inflate the holder with air, and repair it from the inside as well as the outside.

Efforts were therefore devoted to repairing the framed holder. As it was gradually inflated, the holes were temporarily plugged-up with wood, as they appeared out of the water, and as they cleared the next lift were plated as far as possible. By these means the Company were enabled to partially inflate the inner lift on Saturday, and provide in a measure a supply of gas.

Regarding other damage to the works, one shell passed through

the boundary wall close to the offices, another removed part of the gable and roof at the end of No. 1 retort-house, while a third passed through the opposite gable, bursting inside the building, and perforating the hydraulic and foul mains, which damage, of course, had to be repaired before gas could be manufactured. A further one passed through the roof of the inclined retort-house, cutting through one of the principals, damaging the interior of the building, and also twisting and cutting away many of the roof purlins.

Yet another shell struck a small storage tank, about 3 ft. 6 in. diameter by 10 feet long, and made a severe dent on one of the plates, but did not perforate it. The impact burst the shell; and the whole of the adjoining property is split and cut with the shrapnel. A retaining wall near this point has been punctured 3 and 4 inches deep with pieces of shell. Fortunately, the purifiers escaped serious injury; but the windows throughout the works were shattered, and woodwork, brickwork, &c., splintered in various parts of the works—showing the serious nature of the bombardment through which the old works passed.

The Damaged Holder at the New Works.

At the new works, the Superintendent (Mr. Welsh) was having breakfast when the bombardment commenced, and first mistook it for thunder. Feeling sure, however, that this was wrong, he went on to the works, and ascended the large holder, from the crown of which he could clearly see the ships bombarding the

The Shot-Hole in the Gable-End of Retort-House No. 1.

port. He stated that they were within half-a-mile of the shore. There was no mistaking their intentions, so he descended as quickly as possible, and after getting twenty yards away from the holder saw the first shell hit the outer lift. The gas immediately fired, and the holder began to descend. The second shell seemed to strike the holder near the crown, cutting through one of the standards and injuring the girders; and before he reached his house shells were falling in all directions. One came quite close to him, but failed to explode; and when the turmoil had ceased, he went and recovered the shell, which he has presented to Mr. Thomas Bower as a souvenir of the occasion.

Mr. Welsh states that the standard opposite the point where the gas was escaping was made white hot; and there is every evidence of this being the case. In fact, the pulley on the top carriage has fused, and the standard itself is twisted as a result of the heat to which it has been subjected. The crown also shows evidence of fire, and has split three parts of the way up from the top curb. This holder has an untrussed crown; and the inner lift has settled down a considerable distance from the next lift, at the point where the injury has occurred to the outer lift—showing that the supporting framing inside the tank has been seriously damaged.

Water-Works Buildings Injured.

It is evident, that the invaders intended to destroy the water-works in addition to the gas-works, for shrapnel perforated one of the elevated tanks that are such a prominent feature of the district, but fortunately without doing any other serious damage.

A Breach in the Works Boundary Wall, near to the Offices.

The water-works buildings, however, comprising the pump-house, have been seriously injured, and the roof largely destroyed.

I am quite sure that the sympathies of the profession in the serious ordeal through which they have passed will be extended to both the Engineer and Manager (Mr. A. W. Branson) and the Consulting Engineer (Mr. Thomas Bower); and I may express the hope that no further injuries will be discovered.

PERSONAL.

Mr. J. F. Davies, who has been associated with Messrs. John Wright and Co., of Birmingham, for about twenty-two years, and has been for several years General Manager of the gas-stove section of the business of the John Wright and Eagle Range, Limited, has been elected to a seat on the Board of Directors of the Company.

OBITUARY.

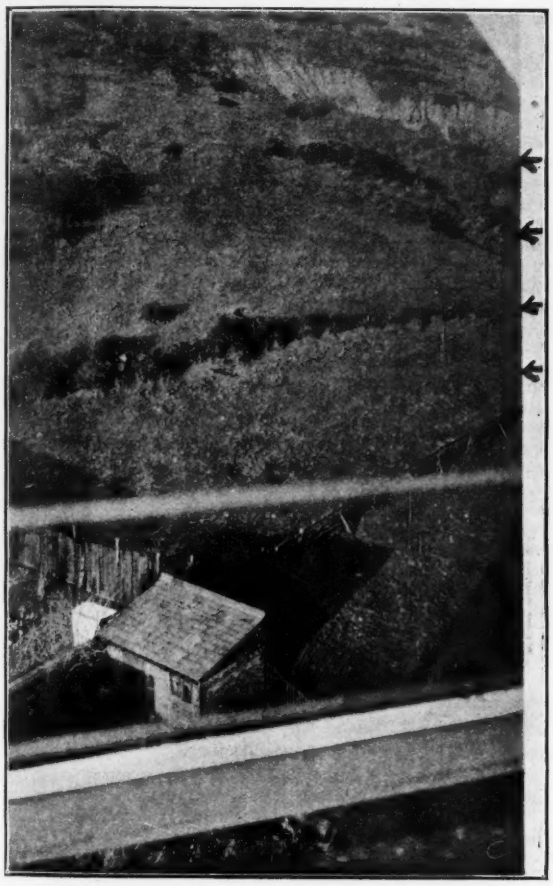
The death occurred last Wednesday, at his residence at Bromley, Kent, of Mr. Frank Sumner, the Engineer to the Corporation of London. Deceased, who had been ill for some months, was in his fiftieth year. He was appointed in 1905, in succession to Mr. D. J. Ross, who followed the late Colonel Haywood. Mr. Sumner formerly held the position of Borough Engineer and Surveyor for Woolwich, and was previously at Bermondsey. He was admitted into the Institution of Civil Engineers as an associate member in December, 1892, and was transferred to the membership list in 1904.

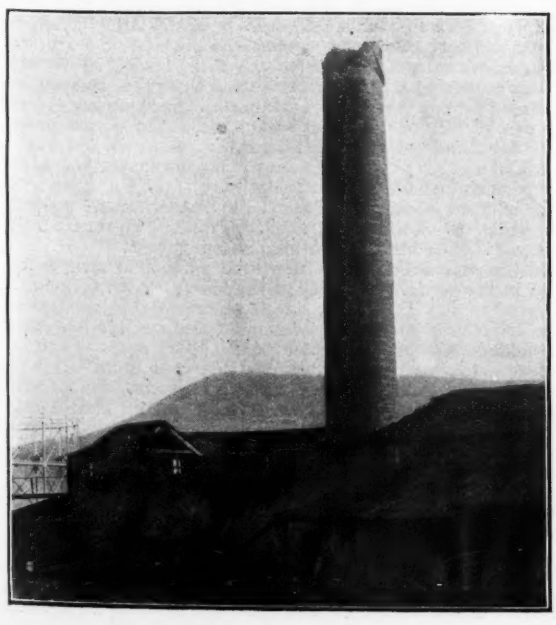
The death occurred last Thursday week, at the early age of 22, of Mr. Ronald Murray, the youngest son of Mr. William Murray, the Engineer and Secretary to the Uttoxeter Gas Company. The deceased was educated at the Heriot Watt College at Edinburgh, where he obtained a diploma for the Engineering Course. Prior to that he had passed the Oxford Senior Examination. During his pupilage with Mr. J. H. Brearley he obtained diplomas in gas engineering, gas supply, and kindred subjects. He had to leave his duties in the spring of the present year on account of indifferent health; and notwithstanding all efforts made to improve his condition he died on the 17th inst. at a nursing home in London, where he had been attended for some time by a specialist. The funeral took place at Uttoxeter Cemetery yesterday (Monday) week.

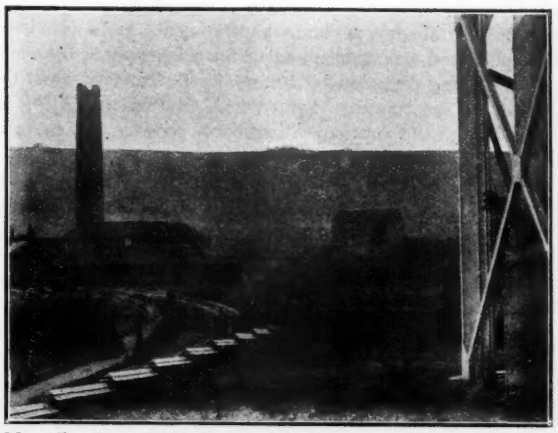
Machine Trenching in America.—It is reported that one of the machines that is operated in America for trenching and ditching has done some particularly good work in both city and country. In the streets of Kincaid, Illinois, U.S.A., at a speed and efficiency contest in trenching for pipe-laying, the machine dug 6316 feet of ditch in six working days, at a cost of a little more than 3s. 4d. per lineal foot. The capacity of the machine was 12 feet depth and 36 inches width. On a gas-pipe line near Calgary, Alberta, Canada, two of the machines dug 86 miles of trench in 63 days. The same model has been employed for open ditches, and (by changing the digging end) for sewers and water-mains on the various camps and training grounds in Canada, of the Canadian Expeditionary Force.

EFFECTS OF SHELL FIRE AT SCARBOROUGH.

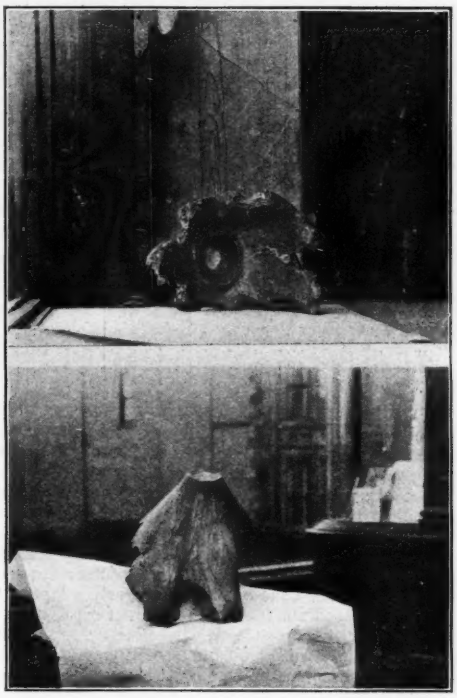
FURTHER evidence of the mischief wrought by the German war-vessels in their attack on the East Coast is furnished by three photographs forwarded by Mr. A. Philip Allan, the Manager and Secretary of the Scarborough Gas Company, illustrating damage done in his neighbourhood. One of the photographs (taken from the crown of the Company's largest holder, which was at the time about half full) shows holes made on the hill-side adjoining. A shell-hole will be seen in a line with each arrow. But these holes, Mr. Allan remarks, are only specimens. There are, of course, lots of others all round the works—especially in close proximity to the oil-tanks. The other photos are of a chimney at the brick-works quite close to the holder already alluded to. This chimney was struck by a shell, and practically demolished. As was stated last week, the only damage sustained by the Gas Company's property was the penetration of a holder-sheet by a splinter of shell.







Mr. Allan has also forwarded photographs of the "nose" of a German 11·2 inch shell, which was picked up not very far from the gas-works. It weighs about 14 lbs. The complete shell, it is said, would be about 3 ft. 6 in. long. At the top of the picture the



piece, with its terrible jagged edges, is seen lying on its side, with an appropriate background of a smashed window-pane. There is, as Mr. Allen remarks, small hope for the thin plates of a gas-holder when pieces like this are flying about.

Carbon Monoxide in Tobacco Smoke.—An American periodical a few weeks ago contained an article entitled "Gas Poisoning: A Cold-Weather Peril." It was in all probability the production of a medical man with little or no knowledge of the subject, and was calculated to alarm the ordinary reader. The President of the American Gas Institute (Mr. E. C. Jones, of San Francisco) promptly wrote to the publishers and called attention to some of the misstatements in the article. In his list of "Dangers to Health," the author enumerated illuminating gas, heating gas, coal-stoves, flue-gas, and defective chimneys; but Mr. Jones pointed out that he had overlooked one very serious generator of carbon monoxide—*i.e.*, the smoking of tobacco. He said: "In 1900 I found that ordinary tobacco smoke contained a large percentage of carbon monoxide; and to bring experiments down to date and verify them, I have analyzed the smoke of tobacco burnt in various ways. The smoke of a high-grade Havana cigar contained 7·2 per cent. of carbon monoxide; that of a smaller domestic cigar showed 4 per cent.; that from an ordinary cigarette, such as we roll in California, contained 1·6 per cent. of carbon monoxide; and smoke from a loosely filled pipe 0·6 per cent. Thus it is shown, that while a medical man goes far afield hunting for a deleterious gas which he claims to be fatal to 'men, dogs, or cats,' in quantities of 0·5 to 1 per cent., he may be writing his conclusions while smoking a cigar which generates as much as 7·2 per cent. of carbon monoxide, and subjects the members of his family to 'oxycarbonism.'"

THE SUPPLY OF COKE-OVEN GAS FOR TOWN LIGHTING IN MIDDLESBROUGH.

A STATEMENT of some preliminary experiments, and a description of the plant and arrangements made for the supply of coke-oven gas for lighting purposes, by Messrs. Sir B. Samuelson and Co., Limited, of the Newport Iron-Works, Middlesbrough, to the Middlesbrough Corporation, will probably prove of interest to all connected with gas lighting.

In the year 1902, on the installation of eighty waste-heat ovens by the Otto Coke-Oven Company, the firm of Sir B. Samuelson and Co., Limited, found at their disposal about a million cubic feet of surplus gas per day. Negotiations were shortly afterwards entered upon with the Middlesbrough Corporation in respect to their taking this gas; but they fell through, and the firm ultimately disposed of it in another direction.

Average coke-oven gas is rather variable in quality, running in the extreme limits as follows: Illuminating power, 9 to 12 candles; calorific power, 500 to 550 B.Th.U. gross, 460 to 510 B.Th.U. net. Generally the gas runs on the high side of the mean of these figures, and falls to the minimum when adverse circumstances occur, such as a gale of wind blowing directly upon one side of the ovens. Coke-oven gas of variable quality might not seem particularly attractive to the gas engineer on a large scale; but it has been known for many years by coking experts that this variation in quality can be overcome as stated below, or by utilizing large holders in order to get an average mixture. As the coking process in the ovens nears completion, the percentages of carbon monoxide, hydrogen, and nitrogen in the gases rapidly increase, until we get an almost total loss of illuminating power. Investigations in this direction show the first gases from the distillation of coal in the coke-oven to be so much better than the latter portion that in coke-oven circles it has become customary to describe them as "rich" and "lean" respectively. The following table shows some typical results from the experiments made by Messrs. Samuelson and Co. in a 28½ hours coking plant.

—	Illuminating Power.	Calorific Power.	
		Gross.	Net.
	Candles.	B.Th.U.	B.Th.U.
Gas from ovens from 1st to 15th hour. .	15·0	669	619
,, ,, ,, 1st to 18th ,, . .	12·7	612	564
,, ,, ,, 1st to 21st ,, . .	11·9	579	535
Average gas ,, 1st to 26th ,, . .	11·1	572	524

A study of these figures makes it evident that the control to a very large extent of quality and uniformity would be in the hands of the coke-oven operator if separate mains were provided for the rich and lean gases respectively. It is the recognition of this fact which has finally led to the present arrangement of double mains being made. In the opinion of the writer, where such an arrangement is made, gas engineers will require to modify their hitherto expressed views as to the standard, and to some extent seek regularity of quality, which coke-oven gas properly adapted to town gas supply can yield. Thus the arrangement of separate mains will be found to be essential to success where large supplies are to be provided, making uniformity of quality important. This, however, will to a great extent be met by the use of the large holder usual in town lighting.

When, about two years ago, Messrs. Samuelson found it advisable to put out and rebuild a battery of ovens, they revived the question of the supply of gas to the Middlesbrough Corporation; and an agreement was arrived at. It was decided to adopt the regenerative type of oven instead of the waste-heat type, so as to get a larger quantity of surplus gas. To the uninitiated it may be explained that, in the regenerative type, heat passing from the ovens, which in the waste-heat type generates steam, is, by reversible regenerators, brought back to the heating flues of the ovens; so that heat formerly available as surplus steam becomes available in the form of surplus gas. With Durham coal, this surplus is normally 55 to 60 per cent.; but when the rich gases form the surplus, there is only 42 per cent. available. The coke-ovens erected at the Newport Iron-Works are designed to supply up to 1,600,000 cubic feet of surplus gas per day suitable for town lighting. They consist of 46 of the latest type of regenerative ovens built by the Otto Coke-Oven Company, Limited, of Leeds.

Each oven, when fully charged, carries 9½ tons of coal; and the coking process is completed, the coke pushed out, and a fresh charge introduced inside of thirty hours. The ovens are capable of coking 2400 tons of dry coal per week. The coal used is of the best Durham quality—a large percentage being from Messrs. Samuelson's own collieries. The gas is taken from the oven-chambers through a central ascension pipe, which separates into two branches, each equipped with a suitable valve. One branch leads into the rich-gas hydraulic main, or town supply; the other into the lean-gas hydraulic main, or gas supply for heating the ovens. When the oven is charged the valve is opened, which allows the gas to pass into the rich main for the first period. This is then closed; and the valve on the lean main is opened for the remainder of the coking period.

The bye-product plant is of the direct-recovery type, and has mains and plant in use—one on rich, the other on lean gas. There is a stand-by apparatus common to both mains when necessary for repairs, &c.

Drawn forward by Bryan-Donkin exhausters, through supplementary mains which act as gas-coolers, the gases are cooled to their dew point. As the governing at this point is of importance, there are also provided air-coolers, which can be bye-passed or used as occasion arises, in order to regulate the temperature. The gas then passes through the tar-sprays, where hot liquor and tar at high pressure are forced into violent contact with the gases, which are thus freed from tar. The clean gases are next drawn through the saturators, where the ammonia contents are converted into sulphate of ammonia [this, after centrifugal drying, is of 25 per cent. standard quality]. After the saturators, the gases are still hot enough to carry their water vapour content; and to remove this they are drawn through surface coolers, then through spray coolers, which reduce the temperature to normal. The sudden chilling effect here throws down the naphthalene, which is recovered from the effluent water by a suitable filter. The gas now passes the exhausters, beyond which the rich gas, under 8 to 10 inches water pressure, passes through a rotary washer (fed with benzolized creosote oil to remove any remaining naphthalene), and thence enters two miles or so of 20-inch pipe, conveying it underground to the Corporation gas-works.

At the gas-works, an exhauster provides the necessary pressure to pass the gas through the purifiers. After purification, the gas passes through a station meter to the holders, whence it is distributed to the town. The gas from an existing battery of 35 Simon-Carvès ovens is coupled-up to the main containing the lean gas of the new plant, which, after passing the exhausters, is maintained at a lower pressure than the town supply; so that, by virtue of its higher pressure, any surplus gas which the town does not require can be bye-passed into the lean main. The mixed gases pass through two benzol recovery scrubbers, and finally to the oven burners, where the necessary amount is consumed for heating the ovens; the benzol in the rich or town gases being retained for illuminating purposes.

It may be stated, in conclusion, that the process of supply has gone on since Oct. 17 without the slightest difficulty. There is installed at the ovens a recording gas calorimeter and an indicating illuminating power test apparatus; so that the quality of the gas is under observation by the coke-oven operators. The gas supplied consistently averages by the calorimeter about 600 B.Th.U. net. The provision of a second main for "rich" gas thus proves to have secured both the quality and the uniformity desired by all concerned. The slight variations which occur are, of course, brought about by the entry into the rich main at stated times of the gases from a newly-charged oven, the admixture of which, with the 42 per cent. of the total gases generated, has the effect of slightly raising the value of the whole for the time being.

WORKMEN'S COMPENSATION STATISTICS.

THERE was issued recently a Home-Office Blue-Book of Statistics relating to the Workmen's Compensation Act and the Employers' Liability Act. The period covered is 1913.

Returns have again been collected from the seven great groups of industries—mines, quarries, railways, factories, harbours and docks, constructional works, and shipping. In these seven groups of industries, the number of employers included in the returns was 138,685; and the aggregate number of persons employed coming within the provisions of the Compensation Act was more than 7½ millions, of whom 5¼ millions came under the heading of "factories." During the year 1913, in the industries referred to, compensation was paid in 3748 cases of death, and 476,920 cases of disablement; the average payment in the case of death being £159, and in case of disablement £5 16s. Taking all the seven groups of industries together, the annual charge for compensation averaged 8s. 11d. per person employed. The figure was lowest in the case of factories, where it was no more than 5s. per person; while for mines (which headed the list) it was nearly five times as much, at 24s. 3d. per head. For quarries, the amount was 10s. 2d. per person; and for constructional work, 13s. 3d. Even in the case of the coal-mining industry, the charge arising under the Act works out at only about 1·09d. per ton of coal raised, though this was slightly more than in the preceding year.

In the year under review, the total amount of compensation paid in the terms of the Act in the seven groups of industries referred to was £3,361,650, compared with £3,174,101 for 1912. The compiler of the statistics estimates that when to this amount are added costs of management, commission, medical, and legal expenses, the total charge borne by the seven industries cannot have been less than £5,000,000. There are included in the figures just given, in addition to accidents, cases of the various industrial diseases (which now number twenty-five) included under the Workmen's Compensation Act. Taking the seven groups of industries, compensation was paid in 27 cases of death from disease, and in 8233 cases of disablement. The bulk of these cases—90·8 per cent. of the total—occurred in the mining industry; while of the remainder 569 were cases of lead poisoning.

A comparison of the present figures with those of previous years shows that in the industries now being dealt with there has been a steady increase since 1908 both in the actual number of cases in which compensation has been paid and in the amount of com-

pensation. This increase, however, has been mainly noticeable in connection with non-fatal accidents. No doubt the assumption is correct that the larger number of cases now coming forward is, partly at any rate, due to the fact that the remedies provided by the Act have become better known and more fully used. Other considerations might also, of course, possibly enter into the matter—such as the condition of trade, involving work at high pressure or otherwise. Anyhow, it is seen from the figures that in 1908 the number of fatal cases in which compensation was paid amounted to 3473; the total sum involved being £536,123. There were also 325,484 disablement cases, involving £1,544,549. In 1913, the figures had grown to 3748 fatal cases, in respect of which compensation of £595,012 was paid; and 476,920 disablement cases, requiring compensation of £2,766,638.

From the returns of accidents in mines last year, it is gathered that the total number of persons employed was 1,114,210, of whom 6549 were females. There were 1312 fatal accidents, and 195,387 cases of disablement. The compensation paid in respect of the former was £227,418, and of the latter £1,010,637. In connection with industrial disease there were no fatal cases; but 7478 cases of disablement occurred, involving payment of £113,203. Adding all these figures together, the total compensation paid in this industry during the year under review came to £1,351,258, as compared with £1,185,727 for 1912. The average amount of compensation paid in cases of disablement in the mining industry, for 1913, was £5 3s.

Statistics are given with reference to the duration of compensation for accidents generally. During 1913, cases lasting two weeks and less than three weeks accounted for 33·83 per cent. of the total number; and those lasting four weeks and less than thirteen weeks, for 33·36 per cent. Only 1·46 per cent. of the cases lasted 26 weeks and over. These figures are exclusive of cases terminated by payment of a lump sum. If they were taken into account, the proportion of long-duration cases would be increased, inasmuch as claims so settled are necessarily usually those likely to last for a considerable period.

Statistics were also contained in the report relating to proceedings in the Courts; and these once more show that only a very small proportion of the claims under the Act become the subject of litigation. The total number of cases under the Workmen's Compensation Act which were taken into Court last year was 10,208; but many were applications for dealing with allowances that had already been granted, and a large proportion were settled out of Court or otherwise disposed of. Thus the total number of original claims for compensation finally settled within the cognizance of the Courts was only 5701. Analyzing the results of these claims, it is seen that the decision was in favour of the workmen in 4392 cases, or 77 per cent. There was last year a marked continuation of the tendency of the remedy provided by the Employers' Liability Act to fall into disuse since the Compensation Act came into full operation. The number of cases under the Act taken into Court, which in 1907 was 604, dwindled last year to 171.

A TEST AS TO TOLUENE IN BENZOL.

The Committee on the Supply of High Explosives draw attention (through their Secretary, Mr. R. R. Enfield) to the following notice issued by them to tar distillers, &c., specifying the standard form of test by which the proportion of pure toluol in the benzol produced by them is in future to be ascertained. All applications to the Committee relating to deliveries or export of benzol must in future comply with this notice. An official circular with regard to the disposal of toluol, &c., was given in the "Journal" for Dec. 15 [p. 623]. A further communication is shortly to be issued on the subject of a standard test for ascertaining the toluol contents of naphtha.

Test as to Amount of Toluene Present in Benzol.

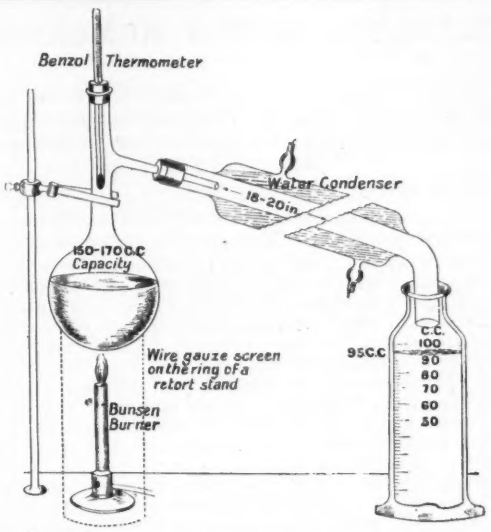
Apparatus.

A distillation flask with side tube, the bulb (preferably coppered) having a capacity of about 150 to 180 c.c. The neck about 5 inches long, and the side tube passing out about the middle of the neck. A water-cooled condenser about 18 inches long. The receiver, a 100 c.c. graduated cylinder. A corrected benzol thermometer. [A drawing of this apparatus is given.]

Mode of Making the Test.

The flask and condenser to be washed with the benzol to be tested and allowed to drain. Then 100 c.c. of the benzol to be poured into the flask from a graduated cylinder and drained-out only. A small naked flame under the flask, with wire-gauze screen to the flame, to protect it from draughts. The rate of distillation to be two drops per second from the end of the condenser. The top of the thermometer bulb to be ½ inch below the side tube of the distillation flask.

When the thermometer shows 84° C. with the barometer at 30 inches, the heating is stopped, the apparatus is allowed to cool, and the volume of the distillate read off. [For every $\frac{1}{10}$th of an inch rise of the barometer over 30 inches, subtract $\frac{1}{10}$th of a degree Centigrade from the reading; for every $\frac{1}{10}$th of an inch fall of the barometer below 30 inches, add $\frac{1}{10}$th of a degree Centigrade.] The flask is then drained into the measure, and any



shortage from 100 c.c. is considered as distillate and added to the volume so read.

Instructions as to Sale and Export.

If 95 per cent. or over is thus obtained as distillate, the benzol may be sold or delivered to a purchaser in this country without any permit being required, subject to its passing the specific gravity test below mentioned; but the Committee reserve the right, if they think fit, to require evidence that these regulations are being complied with.

If less than 95 per cent. is thus obtained as distillate, or the specific gravity does not meet the conditions mentioned below, notice of the amount of distillate so obtained and particulars of the specific gravity, together with a 200 c.c. (or 8 oz.) sample of the benzol, should be sent to the Secretary of the Committee on the Supply of High Explosives, Storey's Gate, S.W.; and thereupon the applicant will be informed whether or not a permit will be granted for the sale or delivery of the benzol without further purification.

If it is desired to export the benzol, it must first be tested in the same manner, and the application for an export permit must be sent to the Secretary, as above, with full particulars of the test and the specific gravity, together with a sample as above mentioned. The specific gravity of the sample taken from the benzol before distillation at a temperature of 15° C. (60° Fahr.) must be between ·880 and ·890.

BENZOL AS A MOTOR FUEL IN GERMANY.

In their issue for the 5th inst. the "Journal für Gasbeleuchtung" quotes from the "Zeitschrift für Angewandte Chemie" and other sources some particulars of substitutes for petrol which, it states, have acquired considerable importance as fuels for motor vehicles and air-craft, in view of the recent scarcity of petrol in Germany.

The efficiency or consumption per horse power developed is approximately proportional to the calorific power of the fuels. The net calorific power (water as vapour) in B.Th.U. per pound is given by Mohr for various fuels, as follows: Petroleum spirit (benzine), 18,000 to 18,900; pure benzene, 17,208; commercial 90 per cent. benzol, 17,100 to 17,280; pure alcohol, 11,452; 95 per cent. alcohol, 10,575; pure naphthalene, 16,722. The following specifications for substitutes for benzol are given:

(1) Benzol-Spirit. (*a*) 95 per cent. methylated spirit, 70 parts; benzol, 30 parts. The benzol is poured slowly into the spirit with agitation—not the spirit into the benzol. (*b*) 90 per cent., or ordinary, methylated spirit, 50 parts; commercial acetone or acetic alcohol, 20 parts; benzol, 30 parts. The spirit and acetone are first mixed, and the benzol added gradually to them.

(2) Benzoline-Spirit. (*a*) 95 per cent. methylated spirit, 70 parts; benzoline, 30 parts. The benzoline is poured slowly into the spirit with agitation—not the spirit into the benzoline. (*b*) 90 per cent., or ordinary, methylated spirit, 50 parts; commercial acetone or acetic alcohol, 20 parts; benzoline, 30 parts. The spirit and acetone are first mixed, and the benzoline added gradually to them.

(3) Spirit-Ether. (*a*) 95 per cent. methylated spirit, 90 parts; sulphuric ether, 10 parts. (*b*) 95 per cent. methylated spirit, 90 parts; sulphuric ether, 10 parts; naphthalene, 1 part.

(4) Acetone-Spirit. (*a*) 95 per cent. methylated spirit, 70 parts; commercial acetone, 30 parts. (*b*) 90 per cent., or ordinary, methylated spirit, 50 parts; commercial acetone, 50 parts.

(5) Petroleum Mixtures. Petroleum and benzoline (petroleum spirit) mixed in the proportion of two to one; or petroleum 3 parts, acetone 1 part; or petroleum 90 parts, ether 10 parts, with 1 part of naphthalene dissolved in it.

ELECTRICITY SUPPLY MEMORANDA.

THE electric-heating business is at present receiving a large amount of attention at the hands of our electrical contemporaries. It is a seasonable subject. The makers of electric-heating appliances, too, are doing their best to get out something that will be more attractive, and receive more lasting patronage, than the electric lamp radiator. Their efforts keep the subject green; but there continue a good many constitutional defects in the new productions, as was seen by a note in our issue for the 8th inst. (p. 824). A further article on the subject has appeared in the "Electrical Times;" and a criticism of some recent remarks in the "Memoranda" is there preceded by the statement that "the electric-heating business shows most surprising activity." We will not ponder over the reason why an electrical man should confess that he is "surprised" by the activity. Of course, the activity of the makers in getting out new designs in order to maintain a position in the market has no particular relation to the extent of the actual business that they do; nor is the number of makers any measure of the dimensions of the business. If one looks down the list of firms making electric-heating appliances—with a knowledge of the varied character of the business in electrical goods done by them, and being acquainted also with the limited area set apart in certain works for the production of the fires, compared with the acres of land required by the makers of gas-fires to meet demand—it is quite permissible to submit that the electric-heating business for some of these firms is quite in the nature of a side-issue, and nothing more.

Surprised at Activity.

The particular point of our recent remarks which is criticized in the most amiable spirit by our friend is to the effect that electric-heating devices do not gain in popularity at the same rate as gas-fires. The critic says that if by this we mean that more gas-fires are supplied than electric-heaters, he quite agrees; but he contends that this is not a test of relative popularity. He holds that the only fair basis from which any such deduction can be drawn is to contrast the rate of increase proportionately to the number of domestic consumers. "It would," he adds, "be found that the rate of increase is far higher in the case of electricity than with gas." Proof as to the accuracy of this statement is not advanced. It is made offhand, and left for the consumption of those who do not trouble to look beyond their nasal organs. We submit that the suggested basis for comparison is not a sound one. How can we contrast the rate of increase of gas-fires proportionately to the number of domestic consumers, seeing that approximately 50 per cent. of the close upon 8 million gas consumers in the United Kingdom are on the prepayment system? One cannot expect—for some time at any rate—this class of "domestic consumers," excepting the better ones, to go in largely for gas heating; but among the ordinary consumers the gas-fire is, we venture to say, in view of the statistics of individual and representative gas undertakings, being fixed at a rate proportionately greater than in the case of electric-radiators. And what is more the rate of increase of the use of gas-fires in electric-lighted households is not a comfortable reflection for electricity suppliers who want to add to the peak load of the winter output by the vending of units for heating at ½d. or 1d. per unit. There are cases within knowledge in which gas-fires have been deposed by electric-heaters in electric-lighted dwellings; but the comparison, from the point of view of comfort and heating efficiency in cold weather, was so disastrous to the electric-heaters that they have been again superseded by gas-fires. These are instances within a small social circle. They cannot, however, be isolated ones, and, in fact, we know they are not from the extensive experience of certain gas companies.

The Rate of Progress.

Then our critic proceeds to make excuses for the slow rate of progress of the electric-heater. Why need he have done this if it be true that the rate of increase, proportionately to consumers, is far higher in the case of electricity than in that of gas? He should have been satisfied. On the contrary, he makes the excuse that, compared with gas, the electric industry is only in its "early youth;" and electric heating is only now becoming a commercial proposition. An industry that is statutorily 32 years old can hardly be said to be still in its "early youth." It is a span of time sufficient surely for the development of reliable heaters; but experience does not appear to have enabled the makers, whose output has (so our critic says) had a rate of increase higher than that of gas proportionately to domestic consumers, to turn out something reliable and free from defect. Our contemporary was itself lamenting only the other week that electric-heaters are neither reliable nor perfect. Further excuses are that, notwithstanding the high rate of increase in adoption, there are at present few electricity supply concerns that offer hiring facilities, although the number is increasing steadily. It is not all a question of hiring facilities; and our critic knows it. There are at least two reasons operating against the exercise of hiring facilities. One reason why some electricity concerns that have hiring facilities do not apply them in connection with electric-heaters is owing to the capital expenditure, and installation, maintenance, and renewal costs, necessitating a full charge for rental, as the price of current for heating purposes—and this current a demand on the generating plant in the winter months—is altogether insufficient to bear any part of these expenses. Another reason why there is no great anxiety to put the things on hire is that dissatisfaction on the part of the consumers often replaces the radiators in store; and as they are usually returned with damaged appearance, they are radiators no one else wants. Southampton can tell a tale of a large proportion of radiators being returned to store, and of conditions being imposed to stop the return flow. Those householders who can afford to use electric-radiators on a scale sufficiently large for decent sized rooms can afford to buy them outright. Those who cannot afford to do so are not likely to have them on hire for any considerable time. If electric heating had all the merit electrically ascribed to it, the heaters would go off like hot cakes. Our critic is altogether wrong in assuming that gas-fires are not purchased outright. A very large selling business is done in them by gas undertakings; and the makers themselves have to keep special staffs of fitters to deal with the installation of fires sold from their various show-rooms direct to consumers, or through architects whose clients prefer gas-fires. There is quite a luxuriant business done this way, but it is such an everyday occurrence that there is no blowing of trumpets over the matter. Our critic has not shown by his further contribution any inside knowledge of the gas-fire business.

Perpetual Youth.

An old friend of ours—one Mr. C. Orme Bastian—recently made a suggestion in "Electrical Industries" which for profound wisdom it would be hard to beat. He intimated that he had been thinking, and, as a result, had arrived at the conclusion that it would be very useful indeed if the Editor of our contemporary would open his "Correspondence" columns for statistical information "as to what are the average hours of use per annum of electric heating for the following purposes: Rooms in dwelling-houses, rooms in hotels, offices, shops, and factories." He had no doubt that there were a sufficient number of instances of heaters supplied through separate meters in all these classes of premises during the last three years, to enable the average hours of use to be calculated from the meter readings, and on the assumption that the various pieces of apparatus installed had only been used "full on." A statement made by Mr. Blackman, of Sunderland, that heaters are "often" used 3000 hours per annum, Mr. Bastian thought was extraordinary, and that Sunderland electricity consumers must surely have very long purses. As to the extraordinariness, we can all agree, seeing that the 3000 hours represent an average of 8·2 hours a day spring, summer, autumn, and winter. Mr. Bastian's own view is that the average for all premises does not exceed 500 hours per annum. The request for an average number of hours of heating in a house or any other place is one of the funniest things of which we have lately heard. There are hardly two houses in which the heating arrangements are treated the same. The number of rooms heated and hours of use vary; and so do the personal views of the occupants of rooms as to when and how much heat is required. Atmospherical conditions also vary in different years, and in different places. Therefore the factors bearing upon the question are several and unstable; and the incidence of these factors will ruthlessly upset any average from time to time. Mr. Bastian seems doomed to disappointment over his desire for an average. Mr. S. T. Allen, of Wolverhampton, and Mr. F. W. Purse, of Carlisle, have both politely ridiculed the desire. Neither of them can see what good purpose is to be served by trying to arrive at an average figure. Mr. Allen points out that, assuming a hundred heaters fixed in private houses, the hours of use would vary per annum between 10 and 1000. Mr. Purse says that at Carlisle they have some electric-heaters which are "no doubt" used for 3000 hours—that is to say, for an average of 8·2 hours per day, year in and year out—while others may not be used 300 hours. Mr. Purse opines that it is preferable to consider the number of heating hours per annum, instead of the number of hours of use per radiator; and on this basis he calculates that the average figure should be 500 hours. But what is the value of a knowledge of the number of hours of heating, when there is no guide as to the extent of the heating requirements during those hours? We are afraid Mr. Bastian has set out upon a wild goose chase.

Hours of Use.

IN solemn silence, so far as we have seen, our electrical contemporaries have passed over the case of the *South Metropolitan Gas Company v. South London Electric Supply Corporation*, which was commented upon in our editorial columns a fortnight since. Reports of the proceedings before Mr. Justice Eve have appeared in our contemporaries, but there the matter has been allowed to rest. The subject, being one of principle and policy, we should have thought would have been of sufficient importance to have warranted greater prominence in the technical journals of the electrical industry, seeing that there are several concerns that require strong warning in connection with the making of preferential charges to those householders who use current exclusively for lighting, irrespective of any other consideration—*e.g.*, extent of demand, hours of use, and so forth. Not only the South London Electric Supply Corporation, but another important Company (as recently noticed in the "Memoranda") have seen the wisdom of withdrawing by circular their at once preferential bait and penalizing threat. But there has been, of

Reticence.

course, quite an accidental omission on the part of most of our electrical contemporaries to notice these circulars. If any of them (other than one) have referred to the circulars, then it has been with such modesty that the reference has not arrested our attention. There seems a little hesitancy on the side of the electrical industry to discuss tariffs from the point of view of whether they in any way confer an undue preference.

A Whip Round.

"Electrical Engineering" is responsible for the indication that the case in which the Ilford District Council are concerned is being extensively supported by subscriptions from municipalities, who are evidently interested in the matter, and so hope to gain something if the Ilford Council are successful. Having referred to the possibility of the case being heard early in January, our contemporary proceeds: "And as municipalities all over the country are subscribing funds towards meeting the cost of the defence, it is apparently thought that there are circumstances in the case which differentiate it from Long Eaton." From the statement made in Court recently [*ante*, p. 620] it seemed that it was conceded that one part of the charge was governed by the Long Eaton case, while the other part was likely to be the subject of agreement. If this happen to be so, then someone will have to perform the task of returning the subscriptions from "municipalities all over the country." And perhaps this will be the best thing that can happen, as it might protect the municipalities from trouble of another order. Recently the Salford Corporation took action against a recommendation of the Electricity Committee which was tantamount to declining to subscribe to the support of the action [*ante*, p. 289].

A Danger of Concentration.

Large concentration of electrical plant on which important demands depend has its drawbacks; and the recent accident at the Greenwich generating station, and the stoppage of the tramway service of London, have (as we have already remarked) afforded illustration of this. There have been other stoppages of the tramway service due to troubles at the generating station; and although it is now stated that a similar accident is not likely to recur, it must not be forgotten that much the same statement was made on former occasions. There are points in a report on the subject presented at the last meeting of the Council which are worth noting in connection with the much-discussed policy of concentration. The cause of the accident was an explosion in the case containing the instrument transformers connected with one of the turbo-generators. The oil in the case was ignited, and thrown on to the surrounding cables, and on to a temporary wooden staging. The fire, it is stated, was "quickly quenched;" but notwithstanding the "whole" of the main cables under the upper switchboard gallery connecting the eight generators with the switchboard were destroyed, the low-tension switch gear on the lower gallery was soaked with water, and several of the panels were covered with lead melted from the cables above. This was sufficient trouble resulting from a fire which was "quickly quenched." Another significant admission is this: "In the case of so large an undertaking as the Council's tramways, it is not possible to arrange for an alternative source of supply which would be adequate in all emergencies." Partial protection has been sought by linking-up with other sources of supply; and this experience has caused the consideration of how such arrangements can be improved and extended.

ELECTRIC COOKING AND HEATING.*

"The following pages are *feeble* efforts of mine to help my 'sisters in distress.'" These are the opening words to the introduction of a volume on electric cooking and heating now before us. The authoress being a lady—Mrs. Maud Lancaster—it would be discourteous not to take the book at her own valuation. Where, however, the "feebleness" comes in is assuredly not in the quantity of reading matter, for there are no less than 338 pages of it. If, therefore, feebleness there be, it must be in the quality of the material composing the book. But we see the book has been edited by Mr. E. W. Lancaster, Assoc.M.Inst.C.E., M.Inst.E.E. While congratulating the gentleman upon this felicitous arrangement, we must hold him responsible, having undertaken the editing of the book, for certain misstatements, hyperbole, and arbitrary postulation which are found in it.

The book is evidently intended for the home, judging by the sub-title; and yet, as already seen, it is addressed to Mrs. Lancaster's "sisters in distress." We are sorry at this indication of her unhappiness; but who are the other "sisters" who require consolation from such a book as this? We can only surmise that they are the little band of lady cooks who have been trying with little luck to enthuse the public (but have so far cruelly failed) over the merits of electric cooking. But let us say at once that for usefulness among "sisters" of any kind—whether in distress, or otherwise—the book is much overdone. It is far too technical and lumpy; and we are pretty certain that the diagrammatic form in which some of the information is presented by Mr. Lancaster (his signature appears in the corners of the graphs) will not be comprehended by the "sisters in distress." But though the book is addressed to such "sisters," there is a little homily for central station engineers regarding their duty in relation to electric cooking; and there is technical description of quite a number of different heating elements, electric cookers, heaters, and other appliances. Most of the descriptions of cookers and other appliances, and installations of electric cooking apparatus, we have read before (in different language) in the various electrical papers, or in the manufacturers' advertising literature. This, however, may be said in favour of Mrs. Lancaster's industry in collecting information ancient and modern regarding electric cooking and heating, together with some erroneous views relating to gas, that it is the most complete result of any similar effort that has yet been brought between two covers. In the hands of people who know where and when to apply a grain of salt, or who have sufficient technical knowledge to save them from accepting as truth every sentence and expression found in the book, the collected material will be both interesting and serviceable. As to the erroneous views concerning gas, we see that Mrs. Lancaster speaks of "Nature's gift of electricity," and of the comparison of electricity, coal, and gas (when properly used) being largely in favour of electricity. Accumulating the different statements in the book derogatory of gas, apparently our lady friend does not look upon gas as being one of "Nature's gifts," though it has a heating value so greatly superior to electricity, and though in its production so much of value is obtained which assists "Nature's gifts" in other directions to brighten life, and which has helped in the march of civilization and the development of industries. Thus does prejudice obscure vision. In references to gas, we read in parts of the book of "poisonous fumes," and of the consumption of oxygen. Poor old Nature! to think that your work has been so badly done that, in giving a gift, you have neglected to make protective provision against harmful effects in the world!—at least, so we gather, think our authoress and her editor. The lady, it seems, has been making research into authorities ancient and modern. There is danger in research of this kind, unless one can bring technical knowledge to bear upon what of the ancient has been superseded by the modern, and unless the research into the modern has been complete. Among modern affairs, Mrs. Lancaster and her "Assoc. M.Inst.C.E." do not know that the term "poisonous" fumes as applied to the products of bunsen flames is not a correct one; that certain electricity undertakings have in their ignorance employed the term in their local advertising literature; and that certain electricity undertakings have (with an action for trade slander looming up to cause them consternation) withdrawn the slanderous term. Mrs. Lancaster and her associate in the production of this book may place on printed record their ignorance of this matter; but they had better warn central station engineers not to use them as authorities on the subject, seeing that carbon dioxide and water vapour from gas-flames cannot be described as poisonous fumes, any more than can the like (only in this case they are very disagreeable owing to their organic accompaniments) from the human system. It is a great pity the book is spoilt by such random statements.

Generally, the volume deals historically with electricity, and supplies information on various matters touching its use in the household; there is an attempt to correct wrong impressions concerning electricity; there is a vacancy in the book respecting the wrong impressions entertained by some folks regarding gas; there is an argument as to time now being ripe for the use of electricity for all domestic purposes (upon which, of course, other people may have, and indeed have, contrary opinions); then comes the treatment of electric cooking from numerous points of view, with copious descriptive matter of the cookers and kindred appliances now on the market; examples are supplied of large electric cooking plant for hotels, &c.; succeeding, water heating is treated upon, as well as room heating; and then, among much else, are references to the minor uses of electricity in the household. Much ground is covered; and long strides are taken in covering it. We repeat that, by any one who wants to know about the included subjects, and is in a position to apply the necessary corrections, the book is worth purchasing.

There will be, on the part of those competent to criticize, a little disappointment with the editing of the book. There is the point as to "poisonous fumes" already dealt with. We have a slip in style in this: "One often hears people say: 'They [we?] thought electricity or electric light had no heat; and how therefore can you [one?] cook by it?'" On the very next page, it is stated that the glass bulb of an incandescent electric lamp "remains cool;" while (a little later on) with electric radiators, the air is partly heated through "contact with a heated surface, such as the *glass bulb* and metal case of the radiator." The chapter containing these statements is headed "Wrong Impressions of Electricity." In another place, we find it said that there are seventeen towns in England which offer current for cooking and heating at ½d. per unit. We believe the bulk of these places supply on the rateable value system, *plus* ½d. At Southampton, Sir John Snell has advised the Corporation to adopt this system in lieu of a flat-rate of ½d. for cooking and heating. In another part, it is seen that "in a small self-contained kettle, 2 pints of water can be raised to boiling-point in twelve minutes for a total consumption of 50-watt-hours, which is equivalent (in theory, but not quite the same in practice) to 50 watts for *one hour*, or 250 watts for *twelve minutes*." We also observe that the *savant* Count Rumford (who basked in the sunshine

* "Electric Cooking, Heating, Cleaning, &c.—Being a Manual of Electricity in the Service of the Home." By "Housewife" (Maud Lancaster), edited by E. W. Lancaster, Assoc.M.Inst.C.E., M.Inst.E.E. London: Constable and Co., Limited; 1914. Price 3s. 6d. net.

of a world's appreciation some 125 years since and onwards to his death) is taken as the authority for the thermal value of house coal. Seven pounds of coal are credited with having only a calorific value of 45,612 B.Th.U., equal to 6516 B.Th.U. per lb. We thought every engineer was aware that more modern tests than those of the learned Count accord to household coal a calorific value from 14,000 to 15,000 B.Th.U. This affects one or two figures following—mainly in the sentence that with coal, "used in a domestic kitchener to heat a small kettle, its efficiency is *unlikely* to reach 10 per cent., or 4561 thermal units in 7 lbs. of fuel." Inaccuracy and indefiniteness (as in the use of the word "unlikely") is something to be regretted in a manual of this kind. Examining a new book such as this, it is better, in the interests of authors and readers, to be (if there is room for it) critical rather than to indulge in word-spinning flattery, which seems to constitute the review of the book in at least one electrical paper. In the remaining paragraphs we shall point out a few other inaccuracies that have escaped the pen of the authoress, and the eye of the supervisor. Probably, however, the latter was unaware that they were inaccuracies.

It is a very strong reflection upon our gastronomic judgment and mental capacity to be told that the cooking we have enjoyed, and have thought nice and nutritious, during the greater part of our lives—gas being the fuel employed in its preparation—has been so injurious to our health (we were not aware of the fact), and what we thought delicious in flavour has been nothing of the kind, because our cook and the cooks and chefs at countless places of public entertainment and residence where we have dined "have been vainly trying to obtain from the apparatus heated by gas and other combustible materials a constant cooking temperature." What we have understood from them, supplemented by judgment on our part as to the results of their work, is that their success has been due to the fact that they could with a gas-stove cook at any rate they liked—slow or fast—and at any temperature that best suited the viands, owing to the wide range of temperatures (not three or four fixed ones) permitted by the gas-taps and jets. In support of electric cooking, it is absurd for Mrs. Lancaster, and her editor, to try to belittle such a mass of excellent experience as can be claimed for the gas-cooker. Here is an example of the extravagant attack made on it:

> Owing to the necessity of giving a fresh supply of air to the gas-burners, and getting rid of the *poisonous* gases and flames [? fumes, Mr. Editor], it is necessary to have a large vent [why necessarily "large"?] to the gas-oven, through which these gases can be given off to the outside air. The oven, therefore, is turned into a flue, and the cooking is done in a flue. A large part of the savoury juices of the meat is thus carried away by the hot *poisonous* gases through the vent to the outside air.

And more of a similar traducing character. Just as "barbarism has been elevated to a dogma" among the Germans, so has the slander of gas been similarly elevated among British electricians. It is abundantly evident that Mrs. and Mr. Lancaster are unaware that, in the modern cooker, the flue-vent is designed to the necessary size for ventilation purposes only; it is evident, too, that they have no knowledge as to the slowness of the current of the air through an oven. If they have any acquaintance with physical science, let them consider this: If an oven acted as a "flue," it would be impossible for the temperature of the air in the oven to be much higher than that of the outside air, and for the cooking that has been and is done in millions of homes by the gas-cooker could never have been, or could not be, accomplished. When, too, a joint of meat has had its exterior coagulated by high temperature at the beginning of cooking, how can a "large part of its savoury juices" be dispersed in the outside air? If this were so, when Sunday dinner was being cooked by the gas-oven in thousands of homes in a residential district, by walking about in the neighbourhood a pretty good and nutritious free meal could be obtained from the floating savoury juices the specific gravity of which would keep them at the lower atmospheric levels. Electrical slanderers bring the ridicule of educated people upon themselves by their absurdities and extravagance. It is quite clear that Mrs. and Mr. Lancaster have no intimate acquaintance with certain of the modern types of gas-cookers.

We read further that three serious troubles with the gas-flames in a cooker are that they are affected by draughts, the use of a neighbour's cooker, and by variations in gas pressure. In a manual of this kind is it right to make such arbitrary postulation? With confidence, we challenge the authoress and her editor to give us concrete figures in support of their assertions in these respects, on any possible variation of pressure on any ordinary and properly-maintained gas distribution system—remembering that gas pressures to-day are maintained (they must be so if gas undertakings require to guard their business) much higher than they were in the early days of the gas-cooker. Will these learned authorities on the variation of temperature through variation of gas pressure tell us what difference in temperature there will be in a gas-oven even supposing the pressure at any time during cooking varied as much as ½ inch water gauge? Such things as variations in voltages are, we presume (as they are unmentioned in the book), unknown to Mrs. Lancaster, but surely not to the M.Inst.E.E. But for the electric-cooker, "constant" temperatures, at the definite positions of the switch, are claimed. Of course, our authoress and her technical collaborator will not deny overlapping of the temperatures with switch changes. But is it true (apart from all question of voltage variation) that the temperatures of the electric-oven are always "constant," no matter the temperature external to the oven, no matter whether or not draughts are playing upon the oven? If they believe this, we rather fancy a little experience of calorimetry where the external conditions were not standardized would soon knock such nonsense out of the heads of the authoress and her editor. The liberty given by the gas-tap enables any temperature desired to be maintained. Speaking of the polished surface oven, the authoress (and the statement has been passed by her censor) makes the categorical statement: "Loss of heat *is* avoided by a highly polished surface all over; and, so long as the brightness is maintained, so long will the efficiency be kept at a high level." A little farther on, we are supplied with the contradiction. [Where was the Editor to permit this?] Curves are given of a lagged oven, and of an unlagged polished oven. At the loadings named (which were about identical), in 65 minutes the lagged oven reached a temperature of 516° Fahr., while 120 minutes were taken by the unlagged oven to attain this degree! After switching-off, the lagged oven cooled down to 217° Fahr. in two hours; the unlagged oven to the same point *in half that time.* In the revision of the book, one or other of the statements had better be deleted. In the disparagement of the gas-cooker, the authoress and the gentleman who attempted to keep her in the path of truth fall back upon the grand old lady, Mrs. Beeton, as an authority on the shrinkage question. It would have been far better in a modern book not to have relied on the old, old story of one of the ancients, but to have taken a modern oven, and cook comparable joints in it and in an electric-oven, at comparable temperatures, carrying the cooking to the same degree, and then ascertain the relative shrinkage. If electric cooking depends for its success on the adoption towards a rival of such tactics as are found in this book (with which rival millions of people besides Mrs. Lancaster have had experience), we pity the electric-cooker—the more expensive cooker in first cost, maintenance, and all-over running costs, including boiling; a cooker, too, as the book shows, which has not the simple structure of the gas-cooker, and has to be so designed that there shall be, as far as possible, some protection for the user.

In dealing with water-heating, it seems to be beyond the knowledge of Mrs. Lancaster and her editor that Parliament has adopted 540 B.Th.U. per cubic foot as the standard calorific value of gas. They apparently do not know, too, that the major part of the gas sold in the country for lighting, cooking, and heating costs between 2s. and 2s. 6d., and not 3s. per 1000 cubic feet. We see, too, that, in their opinion, a kettle boiled over a bunsen flame has only 30 per cent. efficiency, and this low efficiency is partly due to "soot"—soot from a well-aerated bunsen flame! But at 30 per cent. efficiency, gas at 3s., and of less than 500 B.Th.U. per foot, it is remarked that 4042 B.Th.U. are usefully employed out of 27·8 cubic feet, which (on these assumptions) gives the consumer more heat value than from a unit of electricity with a kettle giving 80 to 90 per cent. efficiency! In the hands of electrical advocates, how wonderful are the efficiencies of electrical appliances; how poor those of gas! No figures are supplied in the book to show how much water can actually be heated by a given consumption of gas on variously constructed gas-cooker top plates, boiling-rings, in boilers, gas-heated water-circulators, and geysers. The authoress shows lamentable want of knowledge as to the actual efficiencies of these various pieces of apparatus. "The gas geyser," she says, "has never claimed to be efficient, for it works under conditions which preclude any approach to reasonable efficiency." That is an error; there are geysers and geysers. Other mistakes are that 28·7 cubic feet of gas require 63·106 cubic feet of "atmospheric air" to give proper combustion, while considerable "fumes and poisonous gases" are given off. We hope our preceding invitation will be accepted, and an explanation given as to the nature of the "poisonous" gases. The authoress must know, or, if she does not, Mr. Lancaster does, that the electric water-heaters described in the book are not all practicable; and that few of them (if any, in comparison with other fuels) are really economical in cost and time, or are they convenient for heating respectable quantities of water required in rapid succession for a cleanly family—say, for morning baths. Electric water-heaters have not an efficiency of 100 per cent. or anything approaching it.

We will not deal at length with the chapter on room warming by electricity. Here, again, the reader is misled as to the relative positions of gas and electricity. It is stated: "The gas-fire is also highly inefficient. *Careful* tests *prove* that the efficiency of the best gas-fire is certainly not more than 20 per cent., under most favourable conditions." We do not like to even appear to be discourteous to a lady; but this statement, we affirm, is absolutely and disgracefully untrue. Who made these "careful" tests? How were they made? What is the name of the "best" gas-fire? Is Mrs. Lancaster prepared to say that the results of the tests of the Leeds University Fuel Department, of Professor Bone, F.R.S., of Mr. W. J. A. Butterfield, M.A., F.I.C., and of many other scientific authorities are fabrications? We ask her and Mr. Lancaster not to run away from the point; but to be honest about it, and either withdraw their own statement, or else declare that the investigators are unworthy of credence and of their reputations. Their tests "prove" that the modern gas-fire gives approximately 50 per cent. of the heat developed by the combustion of the gas as radiant heat, 25 per cent. or thereabouts as convected heat, and the balance assists in the ventilation of the apartment by passing away with the products of combustion up the chimney? Another passage, more eloquent in its absurdity than anything else, is this: "The gas used in heating-up the stove itself, and the fuel surrounding the burners, must be paid

for, and *is practically all wasted*, since the heat given out after turning off the gas when leaving the room is of no value." Then there is a reference to the "deadly fumes" from the gas-burners. Mrs. and Mr. Lancaster are obviously unacquainted with the recent tests of the "Lancet," and the prior tests of the Leeds University and others. They are apparently unaware of the several thousand medical men using gas-fires in London to-day. When the authoress speaks of the efficiency of electric radiators, it is a pity she did not make it abundantly clear that economically and for heating efficiency they are altogether out of the running under the worst conditions in which a fire is required.

We must not go to greater length. It is a matter for much regret that so much erroneous statement concerning a competitor should have been made by Mrs. Lancaster (and the regret is deepened that it has been endorsed by Mr. Lancaster, an Assoc.M. Inst.C.E. and a M.Inst.E.E.). It is the erroneous statement that has necessitated our critical examination of the book. It was hoped, when we took up the volume, to find something better in regard to gas than random and baseless assertions such as those to which attention has here been called. At the same time, we are quite willing to give Mrs. and Mr. Lancaster space for any defence they choose to offer, providing they will deal, technically and not superficially, with the whole of the essential points raised in this criticism, remembering that against their descriptive presentments of the structure of electric appliances we have not had a word to say.

EFFECT OF PRESSURE ON THE COMBUSTION OF EXPLOSIVE MIXTURES OF GAS AND AIR.

[An Abstract Translation of a Communication to the "Journal für Gasbeleuchtung," by Herren E. TERRES and F. PLENZ.]

(*Continued from p.* 669.)

EFFECT OF THE INITIAL TEMPERATURE.

IN the investigations already described, only the initial pressure and the concentration have been varied; the other conditions have been kept constant as far as possible. Subsidiary investigations were carried out with the object of determining the effect of the initial temperature on the course of combustion or on the explosive limits; but the scope of these investigations was restricted to a small range of temperature—viz., − 20° to + 30° C., owing to the construction of the bomb used.

The experiments with mixtures of hydrogen and air at the lower explosive limit were made only over the range of temperature 0° to 30° C.; and within this range the temperature co-efficient was found to be so small that no effect of temperature could be established with certainty. At the upper explosive limit, an increase of temperature from 0° to 20° C. appeared to determine explosion in a mixture; but the results were almost within the range of uncertainty in respect of other experimental conditions. More exhaustive investigations are called for so as definitely to establish the effect of initial temperature with mixtures of hydrogen and air.

Mixtures of carbonic oxide and air at the lower explosive limit are more sensitive to the influence of initial temperature, just as they have been shown to be to the effect of initial pressure. Experiments were made with them over the range − 20° to + 30° C.; and the results showed that a change of 10° in the initial temperature may alter the explosive limit or the value for partial combustion to the same extent as two to three atmospheres initial pressure. A rise in the initial temperature extends both the lower and upper explosive limits. At the latter limit a small rise in the initial temperature brings the mixture within the explosive range in which combustion is all but complete.

Experiments on mixtures of methane and air were made with initial temperatures ranging from 0° to 30° C. The effect of the temperature on the explosive limits falls between the corresponding effect on mixtures of air with hydrogen or carbonic oxide. The differences are small within the range of temperature studied; but they show clearly that as the initial temperature rises, the explosive limits are widened or partial combustion improves.

THE EFFECT OF DIFFERENT MODES OF IGNITION.*

The principal investigations already described were made throughout with the same method of ignition. It seemed desirable, however, to study the effect of different modes of ignition.

Wagner had already investigated this point. He found that ignition was most certainly and exactly attained by the fusing of a platinum wire. Lehmann and Wüllner, in their work for the Prussian Firedamp Commission, also came to the conclusion that the fusing of a platinum wire was the most certain method of ignition. F. Emich determined the smallest length of platinum which would fire mixtures of hydrogen and oxygen, and found that its length was inversely proportional to the pressure.

Ignition by an incandescent wire and spark ignition both have their disadvantages. Spark ignition is difficult to define exactly, as it depends not only on the spark gap, but also on the intensity; and this, in turn, depends on the capacity of the secondary circuit and the form of the electrodes and of the primary circuit. In the experiments already made, these conditions were kept as constant as possible. Ignition by incandescent wire is fairly satisfactory, and the temperature of fusing wire is always the same. If the current resistance and time are exactly measured, the heat imparted to the gas through the ignition can be calculated. On the other hand, the catalytic action of incandescent platinum wire may introduce considerable errors through partial combustion—especially close to the explosion limits. Spark ignition had thus been preferred for the principal researches already reported.

The top of the bomb was modified for the ignition tests, in order that the method and point of ignition might be varied as desired. For ignition by incandescent wire, platinum wire 0·1 mm. in diameter was used; and this wire was almost instantaneously fused by the sudden switching-on of a current of 4 volts. The same method of spark ignition was used as in the principal experiments; but three positions of the spark-gap in the bomb were tried—viz., (1) 4 cm. from the top; (2) in the middle; and (3) 4 cm. from the bottom. The incandescent wire ignition was tried in the same positions; the point of ignition being in all cases at least 4 cm. from any part of the wall of the bomb.

The experiments (of which details are given by the authors) show clearly that, with mixtures of air with either hydrogen or carbonic oxide, there is no appreciable difference between the two methods of ignition; but that, on the other hand, the point at which ignition is effected has a very pronounced effect. Ignition at the centre, and, still more, ignition near the bottom, of the bomb gave considerably higher values than ignition near the top for the percentage of combustion. The probable reason why ignition from below gives more complete combustion has been stated by Clowes, and confirmed by Eitner. It is that the hot combustion gases are able, by convection, to preheat the layers of unburned gaseous mixture lying above the point of ignition. Where ignition takes place near the top, the flame spreading downwards meets only cold fresh gas, and heat transference from one burning layer to the next is only directly possible by conduction and radiation. The relatively large differences between the results of earlier investigators of explosive limits may, therefore, probably be explained not only by the differences in the containing vessels used by them, but also by the different positions of the point of ignition.

(*To be concluded.*)

* A somewhat similar investigation of the effect of the method and place of ignition on gaseous mixtures of methane and air has been made recently by Messrs. Burgess and Wheeler. An abstract of their paper on the subject was given in the "JOURNAL" for the 15th inst.—ED. J.G.L.

CONDITION OF NEW YORK WATER-MAINS.

IN the course of a discussion on "External Corrosion of Cast-Iron Pipe" at a meeting of the American Society of Civil Engineers, Mr. W. W. BRUSH, of New York City, gave the following particulars in regard to the condition of the water-mains.

New York City has more than 2500 miles of pipe in its distribution system, and has had practically no difficulty from external corrosion. An examination, made about a year ago, of a length of 48-inch pipe which was laid in 1867 in Central Park, near the large reservoir, in ground that was low-lying and wet a good part of the year, showed the outside coating to be practically perfect. The general condition of the entire pipe system of New York City is such that the outside of the pipe generally shows no corrosion that would affect its life. The interior of the pipe shows very materially the difference in effect of waters supplied to the different boroughs. Croton water has such slight corrosive effect on cast-iron pipe that sections of mains laid shortly after this supply was introduced, in the early forties, or in use some sixty years, show practically no corrosion. Therefore there has been no necessity for cleaning these mains; whereas in Brooklyn, where the water has a comparatively high chlorine content—varying during the past fifty years from a maximum of about 25 parts to a minimum of about 8 parts per million, with an average for the past twenty years of possibly 15 parts per million—there is a corrosive or tuberculating effect, especially on pipe laid uncoated.

The pipe laid in 1858 was mainly Scotch pipe, in 9-feet lengths, and was uncoated. There was also some pipe cast in the United States at about that time and laid uncoated. Such pipe required cleaning, as the tubercles in a 6-inch pipe were of such size that a 2-inch rod could not be passed through the pipe without breaking off some of them. This pipe, when cleaned, was apparently good for another fifty years, so far as the strength of the wall limited the life. The rusting probably advances rapidly on the cleaned pipe. Thus, at Far Rockaway, pipe which had been laid from twenty to thirty years ago, and was cleaned about 10 years ago, now shows tubercles of a depth and volume equal to those found in pipe laid some twenty or thirty years ago, which has not been cleaned. Apparently, with this particular water, tubercles developed in ten years after cleaning, which would have taken twenty or thirty years to develop in the pipe as originally laid.

It is very important, however, to determine under what conditions rapid corrosion of the iron will take place on the exterior of the pipe. In many cases, even where protection would cost large sums, the expense of external protective measures for pipe-lines would pay. On the other hand, there are cases where such protection would not pay. Experience in New York City, where the pipes are frequently laid in ground waters, especially along the water-front, indicates that there is no condition that would warrant any special method of protection.

ALUMINIUM IN THE GAS INDUSTRY.

Its Claims to Consideration.

NOTICEABLE recently by those who are kept closely in contact with gas matters has been the growing frequency with which the use of aluminium is referred to in connection with the industry. It is true that at the present moment much of this use is more or less in the nature of experiment; but this experiment is not so much for the purpose of ascertaining the advantages attaching to the metal, as to prove definitely whether the evident advantages are or are not accompanied by any serious disadvantages. An investigation of this kind is precisely what those who are interested in aluminium desire; for they recognize perfectly well that a metal having such characteristics as this one possesses must be eminently suitable for employment in a great many directions on gas-works and in gas apparatus, if there is nothing standing in the way of its utilization. Some of these directions have, as just remarked, already been recognized by engineers and manufacturers; and there is doubtless other ground of equal, if not of even greater, promise as yet unexplored.

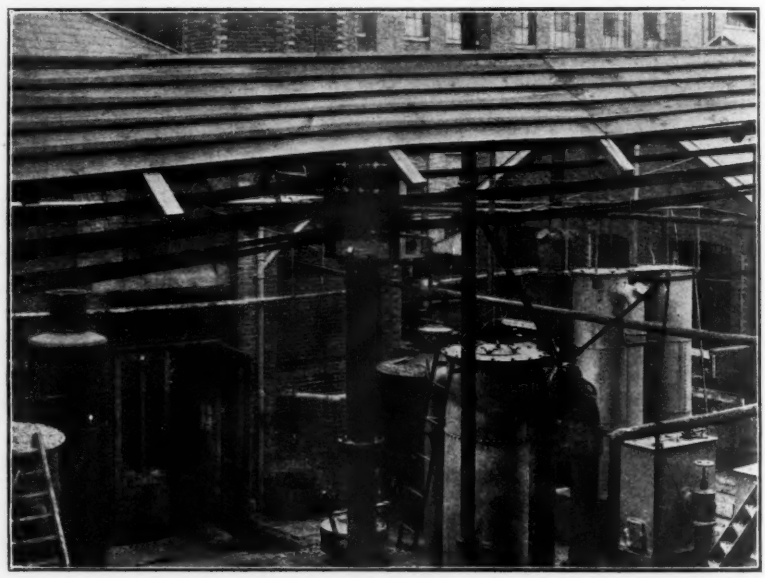
Several occasions can be recalled on which, during the past eighteen months or so, there have been described in the pages of the "JOURNAL" gas-lamps into the construction of which aluminium has entered in a greater or less degree. In some instances it is employed for the outside casings, in others for the tops, and in yet others for the inner portion of the lamps. An aluminium casing is handsome in appearance, and light; but, of course, care has to be taken that it does not get dented, an accident to which the softness of the metal renders it somewhat more liable than steel or copper. Aluminium chimneys do not chip or flake, and do not rust, neither do they induce condensation when cooling; and with these, and tops and reflectors, the consideration of lightness again comes in. The products of combustion do not affect the metal; and inquiry in several directions goes to show that experience generally is satisfactory as regards the effects of the atmosphere. There are many installations of outside lighting in which the lamps are provided with aluminium cases or parts; so they may be said to have been fairly tested.

In connection with a visit to a mantle works some time ago, reference was made in our pages to a new aluminium machine that was being used in the process of impregnating the stockings; this particular metal having been chosen on account of its non-liability to corrode. Almost two years have elapsed since the visit alluded to; and the machine has been found to answer the expectations formed in respect to it. Then, again, readers will have noticed that at the meeting of the Midland Junior Gas Association earlier this month, Mr. R. J. Rogers, of Birmingham, when discussing gas-heated hot-water supplies, suggested that an aluminium gas-boiler would be worth experimenting with in some districts where lime was not a source of trouble. The reason he made this reservation was that he had found lime under the tiles of a hearth to have a destructive effect on an aluminium gas-pipe. On the other hand, after more than twelve months' use, he had failed to discover any signs of deterioration, either from the action of the gas or water, on aluminium domestic water-heating utensils.

Discussing the subject some few days ago with the British Aluminium Company, Limited, of No. 109, Queen Victoria Street, E.C., they emphasized the fact that aluminium resists corrosion by sulphurous gases and fumes of ammonia—characteristics which, in their view, constitute its most important advantages for use with gas, though economy and lightness are also striking features in its favour. Aluminium conductors have been proved in every way suitable for use in gas-works and over producer plants (where copper conductors in many cases on record have to a large extent been eaten into). An excellent example of their use in the latter connection is illustrated in the accompanying photograph, which shows some heavy-current bare aluminium cables installed in the works of a large British engineering firm. The cables transmit several thousand horse power at low tension from a centrally situated gas-driven power house to the various shops containing electrically-driven machinery. Immediately outside the power-house, the whole of the cables are carried across a large yard, in which are situated the producer-gas plants supplying gas to the engines in the power house. Originally, covered copper conductors were employed; but the fumes from the producers had such a powerful corrosive action on both the metal and its covering, that copper had to be abandoned, and was replaced by bare aluminium. These aluminium cables have now been at work for four or five years, and they have so far proved entirely satisfactory, and show no signs of deterioration. An overhead aluminium network feeder has been supplied by the Company to a large gas-works in the West of England, and they feel that there is a good field for this sort of thing among electric power transmission installations in gas-works. Thousands of tons of the metal are in satisfactory operation for overhead power transmission—affording sufficient testimony of its efficiency.

What has been said so far is altogether apart from the question of economy. This aspect, as presented by the Company, may now be looked at for a moment. They point out that aluminium is only one-third the weight of copper, bulk for bulk; and the same consideration applies when it is compared with brass or steel. In the case of electric conductors, one uses a larger conductor, because the conductivity of aluminium is about 62 per cent. that of copper. But even taking this into account, one gets a conductor in aluminium of equal resistance to a copper conductor using only one-half the weight of metal and working out in normal circumstances to anything in the neighbourhood of 30 per cent. of economy in price. There is another advantage they urge in connection with aluminium conductors. Aluminium is more ductile than copper; and this means that bar and rod connections are more easily bent into position. As a matter of fact, when installing round aluminium rod, for instance, one can get most elaborate bends, on the spot, by the aid of an ordinary benzoline blow-lamp. It is claimed that in the matter of erection and jointing there is no difficulty, as aluminium conductors are at least as simple as is the case with copper.

The many other uses of aluminium in relation to gas which have come to the attention of the Company include the making of syphon pumps and of tubes; while the light weight of corrugated sheeting of this metal, with the other qualities already mentioned, makes it very useful. The replacement of brass parts of meters is thought to be another opening for aluminium; while its application even to taps and cocks is held to be only a question of determining the right alloy to use. If aluminium were standardized, the Company say, and known to be a little softer than brass, persons having to handle the cocks would exercise the necessary additional amount of care. A great point in favour of aluminium fittings of this character is the fact that they should be obtainable at least 10 per cent. under the cost of brass. Reference has already been made to domestic utensils of this metal. These are to be seen in many gas show-rooms, and enjoy considerable favour with the public. The high thermal conductivity of aluminium is a factor here. Other uses to which the metal has been, and might be, put will certainly occur to many readers; and in due course further useful data will no doubt be available.



Aluminium Conductors over a Gas-Producer Plant.

The "Lancet" Gas-Fire Tests.—Under the heading of "The Annus Medicus, 1914," reference was made in the "Lancet" for last Saturday to the special investigations carried on during the year—five special articles having been devoted to the "Hygienic Test for Gas-Fires," involving over 300 tests. The following remarks were made: "The test originated in the 'Lancet' laboratory early in the year, by which a simple chemical means was found for detecting whether a gas-fire permitted the escape of combustion products into the air of the room, has received the endorsement of the gas-fire industry; and, as a rule, no gas-fire is accepted 'unless it has passed the "Lancet" test.' We have been appealed to by practically all the leading gas-fire makers in the country to submit their fires to the test. This we have been quite willing to do; and the results have been reported in our columns during the year. The standard has been established, and is effecting a satisfactory hygienic reform which is calculated to place this system of domestic heating on a higher level than before, and to rid it from the reproach of producing an unhealthy atmosphere."

EVENT AND COMMENT.

[Communicated.]

Outlook for Bye-Product Coking.

The present outlook for bye-product coking in the coming year is none too good. The returns for the months since the commencement of the war are in most cases unsatisfactory; and unless there is a distinct improvement in trade conditions all round, there is sure to be a considerable diminution in output, involving possibly the partial closing-down of some installations. The writer knows of a number of plants which are not, nor have been for some time, working at their full capacity. The price of coke is exceedingly low just now; and as the collieries are in many instances reducing their outputs, and consequently are easily able to sell their production, very few plants can show a profit on the carbonization alone. Even this loss might be balanced if the full output was being maintained by the returns from the bye-products; but with the reduced outputs, there is, of course, a corresponding reduction in the yield of bye-products. Unfortunately, a reduction in output on a modern coking plant does not carry with it a corresponding reduction in labour costs. There is comparatively little, if any, casual labour on a coke-oven plant. The men are almost all individually trained for their particular jobs; and although the plant may be only working at half its normal capacity, practically the whole of the men must be retained. There are in various parts of the country a considerable number of bye-product coking plants almost ready to commence operations. One can only assume that each one of these has reasonable expectations of being able to market at least a proportion of its coke from the very start, and hence when all do begin operations, they are bound to affect the state of the market with possibly disastrous results to other parties. The alternative is, of course, the squeezing-out of the operator of beehive coke-ovens, thereby liberating a further market.

It has been proved beyond all doubt that bye-product coke can replace beehive coke for any purpose whatsoever, and the former always has a slight advantage in the matter of price. At the worst of times, the bye-product oven operator looks to his bye-products to help to balance the loss on conversion of coal and coke. In addition to not possessing this standby—if one may so term it—the beehive oven operator gets less coke per ton of coal than does his competitor with bye-product ovens. It is easy to see, therefore, where the price advantage comes in. From the chemical and physical point of view there is little to choose between beehive coke and bye-product coke, provided they are produced from the same class of coal—a fact that is sometimes overlooked when making comparisons. There is absolutely no reason whatsoever why the principal impurities in coke—ash, sulphur, and phosphorus—should be higher or lower in beehive than in bye-product coke. In fact, experiment has proved that neither consistently shows any advantage. From the physical point of view, the factors taken into consideration generally are size, hardness, density, and porosity. As far as size is concerned, beehive coke is larger than bye-product coke in most cases. The size of bye-product coke is limited by the width of the oven; the pieces being approximately half the width of the oven in length. The width of a coke-oven is usually about 20 inches, and hence bye-product coke is seldom more than 10 inches in length. Beehive coke on the contrary is occasionally 2 or 3 feet in length. A certain slight advantage is claimed on account of size; but in actual practice the claim cannot be definitely substantiated in terms of "£ *s. d.*" With regard to the other physical factors, there is no material difference between the two varieties. It is therefore at times like the present, when prices are low and competition is keen, that we must expect beehive ovens to disappear. As a fact many beehive ovens are already shut-down.

A considerable amount of beehive coke is produced at collieries which for some reason or other do not find it advantageous to replace the beehives by bye-product ovens. These reasons are various. In some cases, the size of the colliery—*i.e.*, in terms of production in tons per week, say—would not be large enough to support a bye-product plant. The smallest plant which it is usually considered possible to operate with economy and advantage is one of 20 to 25 ovens, carbonizing about 120 to 150 tons of coal per day. There are many collieries making beehive coke today carbonizing less than this quantity of coal. Again, there are other places making beehive coke in considerable quantities, but which are known to have a comparatively short life, and hence they do not care to erect a plant which may, after the lapse of a few years, have to be scrapped. It is a fact—and one which to the writer's knowledge has never yet been satisfactorily explained on scientific grounds—that almost all the coke used for foundry purposes, as distinct from blast-furnaces, is beehive coke. It is, of course, commonly accepted that foundry coke must contain less impurities than furnace coke, and as a result of this, coke makers in the past have devoted their best coal for this purpose. When beehive ovens were more general, certain ovens using the best coal were set apart for the manufacture of furnace coke. Then when bye-product ovens came in, this practice still continued, and hence it has gradually become an accepted fact that beehive coke is best for foundry work. The writer knows of a plant where bye-product coke is hand-picked, and the picked coke sent for foundry work, and the results are even better than with beehive coke made from the same coal.

AMERICAN COMMERCIAL GAS ASSOCIATION.

Annual Meeting in Minneapolis.

The Tenth Annual Meeting of the American Commercial Gas Association was held in Minneapolis from the 1st to the 5th inst., under the presidency of Mr. Percy S. Young, of Newark (N.J.). A very full programme had been drawn up for the consideration of the members, who were welcomed by the Hon. Wallace G. Nye, the Mayor, and addressed by Mr. E. W. Decker, the President of the North-Western Bank.

The first business on the opening day was the reading of the minutes of the previous meeting and the report of the Directors. Special attention was called in the latter to the valuable work of thirty-six Committees of the Association and also of the Board of Educational Control. It was stated that a new three-year course had been arranged, and was expected to be even more successful than its predecessor, more than 50 per cent. of the students in which had completed their work. The sale of the booklet "Gas Equipment for the Home" had reached 50,000 copies. The report was accepted, and referred to the incoming Board. The report of the Treasurer (Mr. H. B. M'Lean) showed a balance of $6000 in hand. In the report of the Membership Committee it was stated that 622 new members had been enrolled during the past year, bringing the total up to 2828. There was an increase of company members, making a total of 315. The Committee recommended the employment of a travelling representative to organize sections and exploit the educational features of the organization. The President then delivered his Inaugural Address, in which he dealt with the work of the Association and with questions affecting it. The report of the Nominating Committee showed that the following gentlemen had been selected as office-bearers for the current year:

President.—Mr. H. B. M'Lean (New York).
First Vice-President.—Mr. L. F. Blyler (Minneapolis).
Second Vice-President.—Mr. W. M. Crane (New York).
Third Vice-President.—Mr. W. W. Barnes (Brooklyn).
Treasurer.—Mr. W. J. Clark (Mount Vernon, New York).
Secretary.—Mr. Louis Stotz (New York).
Directors.—Messrs. J. B. Myers (Philadelphia), H. G. Reed (Washington), S. Tulley Wilson (Brooklyn), B. J. Kellum (Chicago), Arthur Hewitt (Toronto), T. M. Ambler (Brooklyn), and J. J. Burns (St. Louis).

It was decided that the next meeting should be held in Washington (D.C.), in December, 1915.

In the afternoon, Mr. R. R. Young submitted a long report on "Relations with Customers," containing copies of forms for every department connected with the consumer. Other reports were submitted by Mr. O. H. Fogg, for the Standardization Committee, and Mr. E. C. Bartlett, for the Salesman's Handbook Committee. Mr. J. Arnold Norcross reported on the subject of booklets, and pleaded for more and still better ones, especially on "Lighting." Booklets were also recommended on "Store and Show-Room Heating," "Hygienic Value and Industrial Uses of Gas," &c.

On the afternoon of the second day the reading of papers was commenced, and the first one on the list given below was taken. It led to a very good discussion. Then came an address by Mr. Alan R. Fernald, on "Direct Advertising as Applied to the Gas Business." Mr. R. C. Fowler followed with the report of the Publicity Committee, which gave rise to a long and diversified discussion. Mr. C. W. Hare read a report on the National Advertising Campaign, covering its first five months. Twelve magazines were used, with an average circulation of 9 millions, and reaching, it was stated, 45 million readers. As many as 30,000 replies had been received as the result of advertising; and the Committee claimed some of the increased output as being due to the campaign. The sitting closed with an address on "Education," by Mr. Talles.

The third day's proceedings opened with the report of the Window Display Committee, which was presented by Mr. J. P. Zingg, who showed, by the aid of lantern slides, various displays used in Philadelphia. This was followed by the second paper on the list, by Mr. W. A. Morris, in which it was stated that 80 per cent. of the 16,000 population of Wilmington (Del.) employ gas for lighting. Next came Mr. A. Hewitt's paper on "House Maintenance Service;" and the two papers were discussed together. This brought the morning sitting to a close. In the afternoon, Mr. G. S. Barrow presented a report on "Heating, Ventilation, and Refrigeration," which was followed by Mr. H. K. Dodson's paper on "How to Secure All-Gas Kitchens in Old Houses," and a report of the Committee on Domestic Fuel Appliances, by Mr. J. J. Burns; and all three were discussed together. The sitting closed with Mr. A. P. Post's paper on "Accounting," and the report of the Accounting Committee, which was read by Mr. J. D. Shattuck.

The first business taken on the fourth day was a report by Mr. H. O. Loebell on "The Development of Industrial Fuel." Next came a report read by Mr. W. H. Gardiner on "Differential Rates;" and subsequently reports of the following Committees were presented: Central Development Bureau, by Mr. R. C. Ware; Motion Pictures, by Mr. W. J. Clark; Manufacturers', by Mr. C. V. Roberts, and Commercial Advancement, by Mr. Arthur Hewitt. These reports were not discussed owing to lack of time. For the same reason three important topics were not

brought to the attention of the members—viz., reports of the Committees on Indoor Lighting, Outdoor Lighting, and Educational Control.

The Industrial Fuel Committee met on the morning of the second day, under the presidency of Mr. H. O. Loebell, and considered the papers by Mr. J. L. Meyfarth, on "Recovering Heat from Flue Gases in Hotel Ranges," and Mr. C. L. Henderson, on "Increasing the Efficiency of Gas-Fired Furnaces." Other papers were discussed in the afternoon; among them being one by Mr. E. Raven Rosenbaum, on "High-Temperatures and Artificial Gas," in which he gave an account of the recent development of the oxy-illuminating gas-torch. The last papers taken at the sitting were by Mr. W. T. Hudson, who dealt with "Butcher and Packing House Equipment."

The following is a list of all the papers upon the programme.

"How to Select, Train, and Hold your Selling Force," by Mr. C. H. French, of Newark (N.J.).
"Securing and Retaining Residence Lighting," by Mr. W. A. Morris, of Wilmington (Del.).
"House Maintenance Service," by Mr. Arthur Hewitt, of Toronto.
"How to Secure All-Gas Kitchens in Old Houses," by Mr. H. K. Dodson, of Baltimore (Md.).
"Accounting," by Mr. A. P. Post, of Philadelphia (Pa.).
"Possibilities of the Development of Industrial Fuel from the Commercial View-Point," by Mr. John M'Millin, of New York City.
"Gas-Fired Steam-Boilers," by Mr. C. E. Chapple, of Brooklyn.
"High Temperatures and Artificial Gas," by Mr. E. Raven Rosenbaum, of New York City.
"Flame Temperatures," by Mr. C. L. Henderson, of Wichita.
"China and Glass Kilns," by Mr. T. D. Keyes, of Denver (Col.).
"Railroad Shop Equipment," by Mr. W. F. Clausen, of Winona (Minn.).
"Carbonia Treatment," by Mr. B. B. Yeomans, of Rochester.
"Brass Melting," by Mr. E. F. Davis, of Brooklyn (N.Y.), Mr. O. H. Gindele, of Toledo (O.), and Mr. P. F. Reichhelm, of New York City.
"Forging," by Mr. W. G. Phelps, of Providence (R.I.).
"Converting Core-Ovens to Gas," by Mr. E. J. Burke, of Indianapolis (Ind.).
"Brazing," by Mr. C. E. Chapple, of Brooklyn (N.Y.).
"Pyrometers," by Mr. R. P. Brown, of Philadelphia (Pa.).
"Results of a Campaign on Industrial Fuel," by Mr. L. Gaston, of Knoxville (Tenn.).
"Hotel Business," by Mr. Hawkins, of Detroit (Mich.).
"Hotel and Restaurant Burners," by Mr. Ivan A. Hoy, of Chicago (Ill.).
"Hotel and Restaurant Ranges," by Mr. E. K. Slater, of Newark (N.J.), and Mr. H. D. Gillingham, of Newark (N.J.).
"Syphon Blast Hotel Ranges," by Mr. S. C. Bratton, of Portland (Ore).
"Recovering Heat from Flue Gases in Hotel Ranges," by Mr. J. L. Meyfarth, of Denver (Col.).
"Surface Combustion Broilers," by Mr. Russell E. Sard, of Albany (N.Y.).
"Butcher and Packing-House Equipment," by Mr. W. T. Hudson, of Brooklyn (N.Y.).
"Coffee Roasting," by Mr. A. H. Gindele, of Toledo (O.).
"Changing Dutch Ovens from Wood or Coal to Gas," by Mr. J. B. Redd, of San Francisco (Cal.).
"Laundry Irons," by Mr. H. C. Russ, of Brooklyn (N.Y.).

In connection with the meeting there was an extensive exhibition of gas appliances, a special feature of which was a very fine window display by the Association. Ample arrangements were made for holding social gatherings and for the entertainment of ladies accompanying the members attending the meeting.

GENERATOR-HOUSE WRECKED BY FIRE.

The number of "The Gas Age" for last month contained an interesting illustrated account, by Mr. R. R. Van Horn, the Attorney for the Luzerne County Gas and Electric Company of Kingston (Pa.), of the troubles experienced as the result of having the generator-house wrecked by a burning foundation, necessitating the manufacture of gas in the open air. The following are some particulars from the writer's story.

The Company supply almost a score of towns in the Wyoming Valley of Pennsylvania; their central generating plant being at Nanticoke, on the eastern bank of the Susquehanna River, at the lower end of the valley. From this point the gas is conveyed in high-pressure mains to all the important towns in that section, and to the other towns along the western bank of the river. Under these conditions, it was impossible to close-down work for even a day; and yet a structure of which the foundations had been eaten away by a fire which had tilted the concrete slab on which the generating machinery had been fixed, had to be rebuilt. As though this was not a sufficient obstacle to overcome, the building was in such a condition that the slightest mistake in pulling it down would have caused a complete wreck of the plant and stopped the supply of gas. So badly damaged was the house, that before the slate roofing could be removed it was necessary to brace the side walls from the outside. After the slates were taken off, it was found that the purlins and trusses alone were holding the structure together. The walls had settled 18 inches, and pulled in opposite directions. Rivets could not be removed by the hammer and chisel; and an oxy-acetylene flame had to be pressed into the service for the purpose. While this part of the work was in progress, the men had to be warned continuously of the danger that menaced them. Any unusual jar would have caused the brick walls to fall, and the careful work of weeks spent in preparatory measures only would have been rendered entirely useless.

The building had been erected on a 22-feet "fill," the material of which consisted of slate, mine rock, and coal. The last was excellent fuel for the fire which had eaten its way through the bank to the foundations of the house. This sagged, and then the fire spent its force upon the slab of concrete, 4 feet thick, which also tilted several inches at one end, throwing a great part of the equipment out of plumb, and rendering operating conditions most difficult. Necessity for the continued working of the plant and the safety of the machinery confronted the men at all times.

After a portion of the side walls had been removed, it was necessary to stop work at this point, owing to the fact that some other portion of the building had been weakened to the danger-point. The side walls were removed piecemeal; and yet, despite constant care to avoid trouble, there were many narrow escapes from serious injury.

To these already troublesome and dangerous factors of the problem, the "Clerk of the Weather" added his. During the last few weeks of the operation, there were almost daily rain showers. Owing to the low ground on which the house had been erected, the surface water all drained into the excavations about the plant. This caused slides and hollows, and a large amount of seepage. Labour troubles also confronted the man in charge of the work. Skilled operatives for such tasks as this were regularly employed elsewhere; and the "out-of-works" were the only men available. These, for the most part, came from the mines, and were not equal to a full day of hard, grinding work in the open air and under a summer sun. They worked hard up till about ten o'clock in the morning; but after that hour the quantity of work got out of them was not of much account.

About twenty years ago the region surrounding the generator-house was swamp land. Officials of the Pennsylvania Railway, the line of which is near, directed that this should be filled with whatever material was available. For a depth of 22 feet all sorts of stuff went into the hollow, until it was level with the surrounding territory. It was on this, in later years, that the gas plant was erected. The concrete slab was considered of sufficient permanency to permit of the low land values of the region being taken advantage of. The fire, however, upset these calculations, and for a time threatened the very life of the plant, which had grown from the source of supply for only one town to the dependence of almost a score.

In rebuilding the structure after its being razed under the conditions outlined, a problem of expense and safety confronted the men in charge. Another fire might endanger the new structure, or some other factor, due to the unstable nature of the surrounding land, might develop. To make "safety first" their motto was the decision; and as the first step fourteen new concrete piers were sunk to the clay line—some 22 to 26 feet. This excavation was one of the most difficult tasks of the entire job.

In the settling of the ground, the tar separator had been broken. Into a big ditch this material drained, and the fire ignited it. Tar fumes arising from the material itself, even after the fire had been extinguished, made it almost impossible for the workmen to remain at the digging. A 10-H.P. motor and Sturtevant fan were placed in the various holes; but even with this aid to ventilation the men could not remain in the pits more than two hours at a time. A 5-inch pulsometer and a 2-inch steam pump were used to keep the holes dry.

In keeping the machinery moving for the generation of 600,000 cubic feet of gas per day, the conditions were such that the construction work had to be entirely governed by the needs of the men operating the generating plant. The blower for the blast of the generator was worked by a 30-H.P. motor, and when the reconstruction work started it was removed entirely from its base and placed in a skid. In this manner it was shifted to suit the convenience of the construction hands. The Pelouze and Audouin tar-extractor used in the plant was next suspended by a chain from temporary girders; and under these conditions it did good work. One of the exhausters at the plant had to be discarded entirely. Its foundation had dropped 14 inches at one end, and the great ingenuity displayed by the staff at this plant was not equal to the task of putting it into service under such conditions. The exhauster that remained in operation had to be suspended by chains from I-beams. One Ingersoll-Rand-Corliss compound compressor dropped 4 inches on one side.

The one thing that saved the plant from entire ruin was the fact that the boiler-room escaped damage owing to its foundation having been driven to the clay line and not on the "fill." The tubular boiler feed water heater was supported by chains and timbers; and that it worked at all was a marvel to the gas men who visited the wrecked plant. One of the curiosities was the 6-feet Lowe water-gas apparatus. At one time this was fully 8 inches out of plumb; but it settled back to level.

Mr. C. F. Derby, the Engineer, and Mr. H. G. Williams, the Manager, of the Company, working together, did marvels in handling this most difficult situation. It is no doubt the first time that gas has been manufactured under such trying conditions. The tasks outlined were faced and accomplished without the consumers in the large territory served having at any time the slightest suspicion their source of supply was in grave danger.

WATER AFFAIRS.

Review of the Year.

In accordance with custom at this season, we review the events in connection with the supply of water which have been recorded in the "Journal" during the past twelve months. Compared with previous years, they have not presented any feature of very great importance.

Work and Position of the Water Board.

Dealing first with the Metropolitan Water Board, while there has been no conspicuous addition to the existing works, such as that at Chingford last year, progress has been made with works in hand, and schemes have been prepared for extensions to meet the increased demand for water. At a meeting of the Board held last month, they resolved to apply to Parliament for power to augment the existing supply of water to South London by a further 15 million gallons per day. The scheme is supplementary to the works which were started a few months ago, under the Board's Act of 1911, for the construction of two new reservoirs at Littleton, near Laleham, with a capacity of 3500 million gallons apiece, and having their intake, of 135 million gallons daily, at Penton Hook, near Staines. A third reservoir is to be constructed at Staines. The outlay upon these works and the distributing system connected with them is computed to be nearly £2,283,000, and the total of the scheme authorized by the Act is £3,481,000. The provision to be made is for a population of 7,750,000; and it is anticipated that one of the reservoirs at Littleton will be completed in three years from now. The additional powers to be applied for were briefly indicated in the list of notices of intended applications to Parliament which appeared in the "Journal" for the 1st inst. (p. 484). The works comprise six reservoirs, eight aqueducts or pipe-lines, a well and pumping-station, and a subway; and they will be carried out in London, Middlesex, Kent, and Surrey.

Early in the year the Board were occupied with the subject of new offices in Rosebery Avenue, and certain gentlemen were invited to submit designs. Among them were Messrs. Warwick and Hall, the Architects for the National Gas Exhibition at Shepherd's Bush last year; and, out of six designs sent in, the plans of Mr. F. Austin Hall were selected by Mr. Guy Dawber, the Assessor appointed by the President of the Royal Institute of British Architects. Mr. Dawber considered that, with care, buildings could be erected to the selected design at a cost of about £90,000.

An outstanding question in regard to the supply of water for fires in London, which had been the subject of conferences between representatives of the Board and the London County Council, was under discussion by the latter body early in the year, with the result that, on the recommendation of the Fire Brigade Committee, it was decided to hold a further conference, on the basis that "neither the Council nor the Board is responsible legally for the provision of an adequate supply of water for fire-extinction purposes in places where the existing supply is insufficient, but that it is desirable that a settlement by consent should be arrived at in the matter."

The financial position of the Board was brought under the notice of the members early in April by Mr. Malone, the Chairman of the Finance Committee. Dealing first of all with the approximate results of the year then just closed, he pointed out that the estimated deficiency was £97,230; but he made the reassuring statement that, so far as could be ascertained, it would be only something like £32,000. Mr. Malone called attention to the fact that the Board's expenditure on revenue account had increased, on an average, by £27,088 per annum, while the income had grown at the average rate of £25,744 per annum. He added that the result of legal decisions had been to throw doubt on certain items of income, the effect of which might still further retard the rate of increase. Moreover, in 1923 provision would have to be made for the redemption of the acquisition debt, which would entail a contribution of something like £144,000 per annum. In view of these facts, the Board might, he said, have to consider whether the time would not shortly arrive when the water charges, from which their main income was derived, would have to be thoroughly gone into. Meanwhile, it was clear the deficiencies would continue. At the meeting of the Board on the 11th inst., the Finance Committee reported that the deficiency for the past financial year had been certified by the Auditor at only £15,385. For the current year it is estimated at £94,700.

As usual, the Board's Director of Water Examination (Dr. A. C. Houston) and his staff kept strict watch over the quality of the water supply during the year; and he presented reports furnishing elaborate details of his investigations. In the concluding portion of his last annual report he stated that upwards of eight years' work on the London Water Question had convinced him that to a progressively increasing extent the Board are securing the reasonable, if not the absolute, "safety" of the Metropolitan Water Supply. He said this opinion would carry the more weight since he had been, and still remained, a somewhat merciless critic of any imperfections in the processes of water purification. At the same time, he suggested the desirability of considering the feasibility of occasionally employing supplementary processes of purification.

Before closing this review of the Board's work in the year now ending, it should be recorded that soon after the European War broke out they passed a resolution to the effect that any officer or servant affected by the mobilization should be allowed leave of absence during his naval or military service, and be reinstated on his return without loss of position or emoluments; and they further decided to pay him or his nominee such sum as, with his Government pay, would make up his full salary or wages. At the meeting of the Board on the 16th of October, the Chairman (Mr. E. B. Barnard) announced that no fewer than 494 of the officers and men were serving with the Forces. The Board had, he said, been able to render service to the naval and military authorities in other directions; and during the preceding week they had provided no fewer than 1200 men required in civil employment for various purposes.

Schemes of Improved Water Supply.

There is but little to record in connection with the carrying out of fresh schemes of water supply. Early in the year, Portland was provided with new water-works at an approximate cost of £15,785, from the designs of Mr. R. S. Henshaw; and a comprehensive scheme of water supply, affecting an important Midland area, was completed to meet the requirements of the Cauldon and Waterhouses district—the work being carried out by the Cheadle and Mayfield Rural District Councils. The Catskill aqueduct of the New York Water-Works was partially completed and opened. An installation of Candy filters was put down by the Cromer Urban District Council at their pumping-station at Melton; and they deal with water at the rate of 40,000 gallons per hour. Water-works which the Neath Rural District Council had been constructing at Ystradfellte for about seven years were completed and opened early in April by the Chairman of the Council (Mr. A. T. Williams, J.P.). The watershed is 20,000 acres; and the storage capacity of the reservoir 700 million gallons. The scheme has cost £275,000. The original contractors for the Hurstwood works of the Burnley Corporation having been unable to finish what they had arranged to carry out, the Corporation invited fresh tenders. As the lowest of these was about £100,000 more than the original contract, allowing for work previously done, the Corporation decided to complete the scheme themselves. At the end of May the Water Committee of the Bolton Corporation resolved to commence the construction of two reservoirs in the Eagley and Hordern districts, between Bolton and Darwen. The approximate capacity of the Eagley reservoir will be 450 million gallons, and that of the Hordern reservoir 170 million gallons. The Bradford Corporation, on the recommendation of the Water Committee, accepted tenders for some extensive pipe-laying contracts for the further utilization of streams in the Nidd Valley.

Early in the second half of the year, Bettws-y-Coed was put in possession of a new water supply at a cost of £15,000. The water comes from Llyn Elsi, the rights in which were presented to the Urban District Council by Lord Ancaster, by whom the inaugural ceremony was performed. This event was followed by a decision of the Birmingham City Council to proceed with the laying of a third pipe on the syphon sections of the aqueduct from the Elan Valley to Frankley. This pipe would, it was stated, enable the Corporation to bring from Wales half the water to which they are entitled. After seven years' work, the new reservoir in the Chew Valley was completed in July for the Ashton District Joint Water Committee. A sum of £146,000 was expended in its construction; and it will hold 206 million

gallons of water. The Committee furnish a supply over an area of 52 square miles; and the capital value of their undertaking is nearly a million sterling. New pumping plant was installed by the Stourbridge and District Water Board; and Candy mechanical filters were substituted by the Truro Water Company for the open sand filters in use. The Cardiff Corporation Water Committee decided to proceed, at an estimated cost of £20,000, with the construction of a service reservoir and filters, in order to provide employment. They had some months previously adopted a report by the Engineer (Mr. C. H. Priestley) recommending the laying of new trunk mains at an estimated cost of £48,380. These matters were the subject of a Local Government Board inquiry in respect of an application by the Corporation to borrow £50,497.

During the year Local Government Board inquiries have been held with respect to applications from Barlby, Burnley, Devonport, Doncaster, Holywood, Ivybridge, Leicestershire, Lincoln, Londonderry, Newtownards, Plymouth, Queenstown, St. Germans, Stonehouse, Sudbury, Sutton-in-Ashfield, Torquay, Widnes, and Wribbenhall.

Legislative Matters.

The general water legislation of the year has been so recently noticed [*ante*, p. 181] that no further detailed reference to it is necessary. Authority to raise new capital was obtained by the Bristol Water-Works Company, and also by the Market Rasen Company, who were empowered to construct new works, as were the West Gloucestershire Water Company, as well as to extend their limits of supply. In regard to local authorities, the Abertillery and District Water Board were empowered to build an additional reservoir; the Barnsley Corporation were granted an extension of time for constructing the Knoll Brook works, and they obtained power to make filter-beds; and the Rural District Council of Valley, in Anglesey, were authorized to carry out works for supplying the parish of Llanfaelog. The Mexborough Urban District Council may acquire the undertaking of the Mexborough and District Water Company, Limited; the Newport (Mon.) Corporation may purchase and hold lands and exercise powers for the protection of waters; and the Swindon Corporation may take over a portion of the works and property of the Wilts and Berks Canal Company. Construction and other powers were conferred upon the local authorities at Northwich, Ossett, Porthcawl, Preston, and Weston-super-Mare, as well as upon the Tees Valley Water Board.

A Bill was promoted by the Leeds Corporation to confirm an agreement entered into by them with the Doncaster Corporation for affording the latter a supply of water; but the ratepayers would not sanction it. The Mexborough Water Company applied to be incorporated with further powers; but the Bill was not proceeded with. An application by the Sheffield Corporation in regard to the apportionment of the expenditure of the Derwent Valley Water Board did not go through; nor did the Bill of the Worthing Corporation to sanction the extension of their water limits so as to include two parishes in the rural district of East Preston.

Legal Proceedings.

The legal business in connection with the supply of water presented several points of interest which call for notice in reviewing the events of the year.

An important test case in regard to the legality of a demand note for water charges made by the Tunbridge Wells Corporation against Messrs. Paine, Smith, and Co, Limited, restaurant proprietors, came before the Magistrates early in the year. The Company were summoned for non-payment of a sum of £1 19s. 4d., made up of £1 11s. 6d. as the domestic rate, and 7s. 10d. for water used for trade purposes. It was the latter amount that was in dispute; defendants contending that they were not liable under the decision of the House of Lords in the case of *Avery v. Metropolitan Water Board*. It was submitted, on behalf of the Corporation, that they were justified in charging hotels, public-houses, refreshment-houses, &c., 25 per cent. more for their water than other people in the town, because it was supposed that they used more for the purposes of their business. The special addition of the 25 per cent. made a difference of about £500 a year to the town. The Bench decided that the Corporation were not entitled, in view of the judgment of the House of Lords, to make the separate charge; but they agreed to state a case.

Another action which referred to the supply of water to a restaurant raised again the question of what is a supply for "domestic purposes." The occupier of the "Imperial Restaurant," in Regent Street, requested the Metropolitan Water Board to furnish him with water for domestic purposes; and they refused to do so except by meter, on the ground that the water was used for "trade or manufacturing purposes." Evidence was given on their behalf to the effect that the water was employed for a steam-boiler, automatic flushing-tanks, washing vegetables consumed in the restaurant, and feeding a trout-tank. It was also stated that only the manager and the housekeeper slept on the premises. The case was heard by Mr. Justice Sargant, who, in giving judgment, said it seemed to be quite clear that the water had, in the words of Lord Atkinson in the Avery case, "been supplied and used directly in and for the business;" and he could not find anything in the judgment of the House of Lords or of any of the Courts below in that case which enabled him to limit the *primâ facie* meaning of the words used in section 20 of the Board's Act of 1907 on which they relied. He must therefore hold that the plaintiff was not entitled to a supply of water for domestic purposes otherwise than by meter, so long as any part of the premises was used for trade or manufacturing purposes.

A further case bearing upon "domestic supply" came before the Aldershot Magistrates, in which a consumer was summoned for using for other than domestic purposes—*i.e.*, washing for troops—water supplied by the Aldershot Gas, Water, and District Lighting Company. The defendant admitted that he was washing clothes for fifty men. It was pointed out, on behalf of the Company, that, owing to the war, the number of troops in Aldershot had gone up from 25,000 to more than 100,000, and that the civilian population had also increased. The demand for water was unprecedented, and the Company wished to know where troop washing was being done, so that they might supervise it. The Magistrates found that water employed for the purpose in question was not a "domestic" use of it, and they imposed a fine of 5s.

Towards the close of 1911, the well-worn question of the supply of water to workhouses engaged the attention of Mr. Justice Eve in the Chancery Division of the High Court of Justice, in an action brought by the Bristol Guardians to obtain a declaration that, under the Bristol Water-Works Act, 1862, their workhouses and buildings in the parish of Bristol were entitled to a supply of water for domestic purposes at the rates prescribed in the Act, and not by meter. Defendants (the Bristol Water-Works Company) said that none of the premises in question were "dwelling-houses" within the meaning of the Act; and also that, as in April, 1905, the Guardians agreed with them to pay for the water at the price of 1s. per 1000 gallons, this agreement was still binding upon them. It appeared, however, that the agreement had not been sealed. Plaintiffs claimed that they were entitled to a supply of water for domestic purposes calculated at a percentage, on scales named in the Act, of the annual gross rateable value of the premises. His Lordship said the dispute turned upon the provision in defendants' Act that water was to be supplied at certain rates to the "owners or occupiers of private dwelling-houses;" and the conclusion he had come to was that it would be impossible to hold that an institution such as one of those in question was what would answer generally to the expression "private dwelling-house." He therefore decided that the plaintiffs had failed, and dismissed the action, with costs.

The Guardians, however, were still of opinion that they were right; and they gave instructions to their Clerk to enter an appeal. This was heard by the Master of the Rolls and Lords Justices Fletcher Moulton and Buckley early in March, 1912. The arguments extended over two days; and at the close their Lordships reserved judgment, which was delivered a few weeks later. The Master of the Rolls agreed with Mr. Justice Eve, and thought the Guardians' appeal should be dismissed. Lord Justice Buckley concurred. Lord Justice Fletcher Moulton, however, as the result of his examination in great detail of the various sections of the Company's Acts, particularly of the charging section of the Act of 1862, came to the conclusion that the appellants were entitled to the declaration for which they asked, and to have judgment. The majority of the Court being against the Guardians, the appeal was dismissed. They, however, took the case to the House of Lords; and it was argued before Lords Loreburn, Atkinson, Parker, and Sumner towards the close of last year. At the con-

clusion of the arguments, their Lordships reserved judgment, which was delivered early in February, and was unanimously in favour of the Company. Lord Loreburn said a workhouse was not a private dwelling-house; and he agreed with the Court of Appeal that there was no section in the Special Acts which imposed on the Company the duty of supplying dwelling-houses which were not "private" with water for domestic purposes. His Lordship acknowledged that, in construing Private Acts, the rule was to interpret them strictly against the promoters and liberally in favour of the public. But he pointed out that a Court was not at liberty to make laws, however strongly it might feel that Parliament had overlooked some necessary provision in, or even been overreached by the promoters of, a Private Bill. It was not, therefore, their Lordships' intention to repair the blunders found in legislation. It was for Parliament to say whether it would interfere. The appeal was accordingly dismissed.

An appeal by the Colne Valley Water Company against an assessment of £90 rateable value upon their mains in the parish of Northolt came before the Justices at the Middlesex Quarter Sessions on the 31st of January; but they were relieved from trying the case, as an arrangement had been come to by which the old rateable value of £35 had been restored, and respondents had agreed to pay the appellants' taxed costs. The rateable value which it was sought to impose upon the Company was a sum equal to 65 per cent. of the gross receipts in the parish, and in respect to directly productive mains only. It was calculated that if this percentage were to be applied to the entire undertaking of the Company (directly and indirectly productive parts), the hypothetical tenant would have to pay, as rent, rates, and tenant's working expenses, £78,358, with total receipts of only £54,714; thus obtaining no remuneration as his share, but incurring an annual loss of £23,644.

An important question in regard to liability for damage caused by burst water-mains came before the Court of Appeal. In the summer of 1913, an action was brought by the Charing Cross, West End, and City Electricity Supply Company, Limited, against the Hydraulic Power Company, to recover the sum of £717 for damages caused to their underground pipes and works through the bursting of the defendants' mains in the neighbourhood of Cannon Street, E.C., on three days in February and one day in August, 1912. The defendants denied that there had been any negligence on their part, and contended that they were not liable, especially as they submitted that the fractures of their mains were caused by subsidences due to the laying of the plaintiffs' cables. The action came before Mr. Justice Scrutton, without a jury; and he found that defendants had not been guilty of any negligence. But he gave judgment for the plaintiffs, on the ground that, apart from any question of negligence, the defendants were liable, as they had for their profit brought into the road a dangerous thing—*i.e.*, water at very high pressure, which had escaped and thus caused the damage. The defendants appealed, and the case was heard by Lord Sumner, Lord Justice Kennedy, and Mr. Justice Bray. Without calling upon Counsel for the plaintiffs, their Lordships unanimously dismissed the appeal. Lord Sumner said the question was whether, in the circumstances, the plaintiffs had suffered injury or an invasion of their rights by a nuisance on the part of the defendants. He thought they had; and, further, he considered that the case was indistinguishable from that of the well-known one of *Fletcher v. Rylands*.

A Divisional Court, consisting of Justices Avory, Rowlatt, and Shearman, had before them an appeal by the Assessment Committee of the Chertsey Union against a judgment by the Court of Quarter Sessions in respect of the Walton pumping-station of the Metropolitan Water Board, whereby the gross value was reduced from £15,810 to £11,677, and the rateable value from £10,550 to £7785. The matter came up on a special case, and originally three questions were raised, one of which was decided against the Union, and the other two in their favour. The first point was whether anything should be added to the value of the premises, consisting of an intake from the River Thames, a canal, and a pumping-station, by reason of the fact that the intake was used for bringing into the rest of the premises water which was distributed among the inhabitants of London. The second point related to property on which the Committee put a rate, consisting of land and of buildings thereon. It was argued for the Board that, inasmuch as they were able to borrow money at a cheap rate, the ordinary percentages should not apply either to the land or to the machinery and buildings. The figures put by the Union were 4 per cent. on land and 5 per cent. on buildings; and as the Board borrowed at 4 per cent., it was submitted that they ought not to pay more than this rate upon the whole. This point was decided in favour of the Union. The other was as to whether there were certain embellishments on the property; but it was dropped. Mr. Justice Avory expressed the opinion that on the first point the appellants succeeded, and that the case must go back to Quarter Sessions for the principle of added value to be applied, and the figures adjusted accordingly. On the second point he thought the Magistrates were right. The other Judges concurred, and the appeal was allowed.

Mr. Justice Shearman had before him, by way of special case, an appeal from the award of an Arbitrator which decided that the Metropolitan Water Board had power, under their Act of 1907, to lay a main or pipe under the London, Brighton, and South Coast Railway without paying any consideration therefor. It was contended for the Company that if the Board wished to exercise their powers they must first acquire an easement. The soil occupied by the main became vested in the Board for an estate; and this involved the acquisition of the land. The question for the decision of the Arbitrator was: Are the Board entitled to lay a main beneath the railway without purchasing or acquiring from the Company any easement or right? His Lordship, in giving judgment, said he had to see how sections 61 and 96 of the Act of 1907 were to be read together; and he came to the conclusion that under the former the Board were entitled to run the main in question without acquiring any easement. As to section 96, the question he had to decide was whether under it this right was taken away or qualified as regards the railway companies named therein. It was quite clear, he said, that the section enacted that the ordinary compensation clauses of the Public Health Act did not apply, but that the specific provisions of the Board's Act did apply. On the whole, reading the two sections together, it seemed to him that there was nothing to prevent the Board from laying their main without acquiring any easement. The answer to the question asked by the special case was, therefore, in the negative; and consequently the award will stand.

An unusual case of an action being brought against a gas company by a water authority was heard in the Hamilton Sheriff Court; the Bothwell and Uddingston Gas Company being charged, at the instance of the Lanarkshire Middle Ward District Committee, with an offence under their Act of 1892. It was complained that the Company had fraudulently prevented a water-meter at their gas-works from registering by so fixing a branch-pipe with a stopcock as to permit of water being taken from the pipe before it reached the meter, and being delivered into a well, from which it was pumped for cooling coke and for the general purposes of the works. For the defence it was stated that the pipe and stopcock had been put in by the present Water Engineer's predecessor in 1903, with the object of getting rid of impurities which the Company had complained were injuring their boilers. The pipe was laid by the Water Authority, and the Company had nothing to do with it. The Sheriff found that the charge had not been made out.

Two arbitration matters may be conveniently noticed here. Early in the year, several days were occupied in hearing, by Mr. H. Howard Humphreys, arguments and evidence in an arbitration to determine the price which the Darwen Corporation were to pay the Bolton Corporation for the supply of 300,000 gallons of water daily at a point on the boundary of Darwen. The proceedings arose on section 28 of an Act obtained by the Bolton Corporation in 1905 authorizing the construction of additional waterworks; and the section in question was inserted by the Parliamentary Committee at the request of the Darwen Corporation. The price put forward for Bolton was 13·023d. per 1000 gallons; that submitted for Darwen was about 5½d. In the result, the Arbitrator fixed the figure at 7¼d. It was stated at a meeting of the Darwen Town Council that the cost of the proceedings to the town, together with their share of the Act of 1905, was about £2000; but as every penny per 1000 gallons of water represented £450 a year, it was thought the expenditure had been justified. Early in June, the award of the Arbitrator in connection with the dispute between the Nelson Corporation and the contractors for the construction of the new reservoir at Ogden was made known. The original contract was for

£35,000, and provision was made for extra payment for work certified to be necessary. The Corporation admitted their liability in this respect to the extent of £7000; but the contractors (Messrs. White) preferred to submit the matter to arbitration. Under the award, the Corporation have to pay £50,550, or £14,000 for the extra work, which is £7000 more than was anticipated.

Technical Business.

Coming to the technical matters connected with water supply which have engaged attention during the year, the two meetings of the Institution of Water Engineers first call for notice. At the summer meeting, which was held at Stockport early in June, under the presidency of Mr. Thomas Molyneux, Assoc.M.Inst.C.E., the Water Engineer to the Corporation, the members received a cordial welcome from the Mayor (Councillor Thomas Worthington Potts, J.P.). In his Inaugural Address, the President referred at the outset to the steady progress of the Institution, as shown by the increase in the membership —the total being 422, or 21 more than it was a year previously. He then dealt successively with the subjects of the watershed of the Mersey (the Stockport Corporation being the latest, and probably, he thought, the last, to utilize a fresh tributary of the river for water-supply purposes); the mechanical filtration of upland waters; reinforced concrete for the construction of covered reservoirs; the distribution, charge, consumption, and waste of water; and water divining. The President was duly thanked for what was acknowledged to be a very useful and practical address. Two papers were submitted—viz., "The Character of Mechanically Filtered Water," by Professor Sheridan Delépine; and "The Aëration and Filtration of Water for Swimming Baths," by Mr. L. Holme Lewis. A lecture, illustrated by lantern slides, was delivered by Dr. George Hickling, F.G.S., on "The Geological Structure of the Stockport District." Some interesting visits were paid, among other places to the Kinder reservoir and filtration plant and to the Lyme Park reservoirs of the Corporation, particulars of which were furnished by the President in the form of a paper. The members were hospitably entertained on their visits; and they spent an enjoyable evening together on the occasion of the annual dinner.

At the winter meeting, which was held in London on the 11th inst., under the presidency of Mr. Molyneux, two papers were submitted and discussed—viz., "Notes on Scraping a Fifteen-Inch Trunk Main at Batley," by Mr. J. C. Barrowclough; and "The Whitton Pumping-Station of the Ipswich Corporation Water-Works," by Mr. C. W. S. Oldham. It was hardly to be expected the meeting would pass off without some reference to the war, more especially as one of the members—Dr. Ad. Kemna, of Antwerp—has unhappily had personal experience of a very alarming incident in connection with it. The Waelham works of the Antwerp Water Company were systematically bombarded; but Dr. Kemna wrote that a scanty supply of water was being obtained from an emergency plant. The President made the satisfactory announcement that, in respect of finance, the past year was the best the Institution had ever had; and the balance carried to the accumulated fund was £192. The new President is Mr. F. W. M'Cullough, of Belfast, who, in thanking his colleagues for his election, offered them an invitation from the Lord Mayor and the Chairman and members of the Water Trust to visit his city for the summer meeting next year.

As customary, the second day of the annual meeting of the German Association of Gas and Water Engineers, which was held in Munich from the 1st to the 3rd of July, under the presidency of Herr Reese, of Dortmund, was devoted to water subjects. The proceedings opened with a paper by Herr Kreutz, of Augsburg, on "Prussian Water Board Regulations in Connection with Town Water Supply." The next was by Herr Ernst Henle, of Munich, on "The Influence of Forests on Water Supply;" and this was followed by one on "The Removal of Manganese from Water," by Dr. Tillmans, of Frankfort-on-the-Main." Herr Otto Vollmar, of Dresden, took as his subject "Removing Manganese from Artesian Well Water in the Elbe Valley, and the Dresden Plants Employed for the Purpose." "The Biological Results of Rapid Filtration at the Barmen Weir" was the title of a paper by Professor Kolkwitz, of Berlin; and Herr M. Gaze, also of Berlin, described "A Graphic Process for Measuring the Electric Drive of Pumps." The Water-Works Committee presented their report, in which they stated that their work had been largely directed towards altering the scheme of the statistics of German water-works which are issued by the Association, in order to reduce the cost of publication. Dr. K. Bunte, as General Secretary of the Association, issued a circular of inquiry to water undertakings in regard to the quality of the water supplied; and the replies from 309 towns were brought to a common basis, and tabulated in an appendix to the report. The Pipe Committee presented a report (signed by Herr M. Hase, which contained particulars of a scheme for the adoption of uniform signs and colours for plans of mains —blue being chosen for those conveying water.

Mr. W. H. Booth submitted to the Association of Engineers-in-Charge a paper on "Water-Raising and Measuring"—or, more strictly speaking, he delivered a lecture on the subject with the aid of lantern slides, and distributed the paper to the members. After referring to the early history of water raising, the lecturer dealt in considerable detail with modern methods, such as the air-lift and the Humphrey pumps. In the second portion of his subject he described a number of meters and recorders, and explained the Venturi principle. At the close of the lecture, the late Mr. W. B. Bryan, who presided, gave some interesting particulars in regard to the pumping plant of the Metropolitan Water Board and other matter arising out of the lecture.

At a meeting of the East Midland District Division of the Institution of Municipal and County Engineers held at Hinckley, Mr. E. H. Crump, the Engineer and Surveyor to the District Council, read a paper on "Eleven Years' Municipal Work at Hinckley," in the course of which he gave some particulars of the water supply of the town, which was acquired by the District Council under their Act of 1888. The water is obtained from a disused coal shaft at Snarestone, fourteen miles from Hinckley. Before the West Midland District Division, Mr. H. J. Coleby, the Engineer and Surveyor of the Atherstone Rural District Council, read a paper on "Water Supply in the Rural District of Atherstone." He dealt with the sources and the distribution of the water, indicated the faults in the distributing systems, and described the new boring. The paper gave rise to a very good discussion.

Reference has already been made to the partial completion of the Catskill aqueduct of the New York Water-Works. An interesting paper, containing a description of the works, with some notes on the water supply of Greater New York, was read before the Society of Engineers by Mr. W. T. Taylor, and at a joint meeting of that Society and the Institution of Municipal Engineers.

It will doubtless be remembered that, through the liberality of Mr. Charles Hawksley, the Council of the Institution of Mechanical Engineers established a lecture in memory of Mr. Thomas Hawksley, who was one of the Past-Presidents of the Institution. The delivery of the first lecture was entrusted to the late Mr. E. B. Ellington, M.Inst.C.E., also a Past-President, who took for his subject "Water as a Mechanical Agent." The second lecture was to have been given on the 30th of October by Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the Metropolitan Water Board; but a lamentable occurrence prevented it—Mr. Bryan having died suddenly on the preceding Tuesday. The lecture, which was on the subject of "Pumping and Other Machinery for Water-Works and Drainage," had, however, been prepared; and arrangements were made for the deceased's son, Mr. Bernard W. Bryan, M.Inst.C.E., the Chief Engineer of the South Essex Water Company, to deliver it on the 4th inst. Both lectures were repeated in the Provinces.

At the congress of the Royal Sanitary Institute at Blackpool early in July, Mr. J. S. Brodie, the Borough Engineer and Surveyor, in the course of his opening address in the Engineers' and Surveyors' Section, remarked that the question of dealing with public water supplies as a whole, instead of each community rushing to be first in the field to secure its own particular requirements, was coming more and more to the front in the British Islands; and he expressed the hope that before very long public opinion would move more quickly towards legislation in this direction. He mentioned the comparatively short-period loans allowed by the Local Government Board for reservoir construction as a point of much importance to public water authorities; and he suggested that the only way to overcome this was by the increasing use of reinforced concrete construction, whereby the first cost of the work is so much reduced that

there is no extra burden in meeting the repayment of loans for the shorter period.

The subject of the standardization of water-fittings was under consideration at the sixth annual general meeting of the Incorporated Joint Committee on Water Regulations, held in London, under the presidency of Alderman Hamilton. In the report of the Executive Council, which was read by the Secretary (Mr. W. R. E. Coles), it was stated that the year had been characterized by a very marked increase in the interest evinced by water authorities and architects, as well as by the manufacturers of water-fittings and others, in the objects which the Committee was originally formed, and subsequently incorporated, to promote. The Council had endeavoured to direct usefully the growth of this interest. Details of their work were given, and the report was adopted. Certain recommendations by the Standardization Committee with regard to the amplification of the specifications were agreed to.

Miscellaneous Matters.

An unexpected New Year's gift was received by all consumers in the district of the Maidenhead Water Company, in the shape of an announcement of a rebate of 25 per cent. for the preceding half year. Following as it did on other concessions by the Company, it gave much satisfaction. The matter deserves notice, as the rebate was the sequel to a decision come to by the ratepayers, by a majority of three to one, against the purchase of the water undertaking by the Corporation for £84,000.

At a meeting of the Water Committee of the Manchester Corporation in the spring, the Chairman (Alderman Holt) drew attention to a recommendation that the undertaking of the North Cheshire Water Company should be purchased for £138,400. He stated that the revenue would pay interest and sinking fund, and that at the end of fifteen years there would be a saving of £6000 per annum to the ratepayers of the district. The recommendation was adopted without discussion. The Company supply an important residential portion of Manchester. A proposal to purchase the undertaking of the Chester Water Company came before the Town Council, and the Finance Committee were requested to consider the financial points involved. A movement was set on foot jointly by the Corporations of Penryn and Falmouth for the acquisition of the undertaking of the Falmouth Water Company. Consequent, apparently, upon dissatisfaction with the existing water supply, the Kenilworth Urban District Council resolved to consider the advisability of purchasing the Water Company's undertaking, "or by some other means securing an efficient water supply for the town."

The participation of Nottingham in the Derwent Valley water scheme has given rise to much dissatisfaction in the town from a sanitary as well as a financial standpoint; and last spring the inhabitants were scared by the decision of the Water Committee to discontinue for a time the use of the water, owing to its effect on their wrought-iron pipes. Water pollution troubles arose at Boston and Kenilworth. In the former case the Local Government Board intervened, and deputed an Inspector to inquire into the matter. In the latter case, Mr. Hill, the Board's Geological Expert, assured the District Council that the pollution was probably due to unavoidable causes arising during the sinking of a borehole; and the Water Company's expert (Mr. H. Ashton Hill, M.Inst.C.E.) concurred in this view. The town was, however, subsequently visited by an epidemic of typhoid fever, which led to proceedings being taken against the Company, and the recovery of damages.

Some amount of uneasiness was displayed in the Manchester Corporation in regard to the safety of the Longdendale Valley reservoir embankments; and an attempt was made to have their condition investigated by one of the Engineering Inspectors of the Local Government Board. But reports were submitted to the Council by Messrs. G. H. Hill and Sons, the Corporation Engineers, as well as by Mr. Joseph Parry; and, in the result, the majority of the Council expressed confidence in the Water Committee, who had taken up the position that so long as the water-level in the reservoirs was kept a certain distance below the overflow weir, there was no possibility of danger.

In concluding these miscellaneous notes, reference must be made to the effect of the European War on the water supply industry. At the outbreak of hostilities, rumours spread through Germany of water supplies having been poisoned by the introduction of germs of epidemic diseases. Fortunately they were without foundation; but they directed attention to the question of the generally increased danger of contamination of water supplies in time of war. Some experiments were carried out by Dr. Pfeiffer, the Chemist at the Municipal Gas and Water Works at Magdeburg, on surface water (drawn from the Elbe and purified by filtration) with which the town is supplied; and they were duly noticed in the "Journal" a fortnight ago (p. 591). At home the effect of the war has been to cause a number of works to be guarded, and has called forth a willing response to the appeals for men and money to support the cause which the country is fighting to uphold.

Personal Matters and Deaths.

Before closing this retrospect, a few personal matters which have occurred during the year call for brief notice. Mr. Ratcliffe Barnett was appointed Engineer and Manager of the water-works of the Keighley Corporation during the building of the Sladen Valley reservoir, of which he is the Constructing Engineer. Mr. James Burch, the Secretary of the Canterbury Gas and Water Company, retired after completing forty-six years' service; and Mr. W. A. King, who had been Chief Clerk and Accountant for eleven years, was appointed his successor. Mr. C. Horobin, who had been in the service of the Lincoln Corporation since 1906, was raised to the position of Chief Water Engineer. Mr. H. Hurd, the Surveyor to the Broadstairs and St. Peter's Urban District Council, was appointed their Water-Works Engineer. Mr. F. W. Macaulay, the Resident Engineer of the Elan Valley works of the Birmingham Corporation, was made Elan Supply Engineer. Mr. Joseph Parry resigned the position of Water Engineer to the Liverpool Corporation, and was appointed Consulting Water Engineer; Mr. J. R. Davidson, the principal Assistant-Engineer for the Rivington and Vyrnwy works, being promoted to the vacant office. Mr. J. W. Restler, the Deputy Chief Engineer of the Metropolitan Water Board, became Chief Engineer, consequent upon the death of Mr. W. B. Bryan. Mr. W. Thompson, of Shrewsbury, obtained the position of Water Engineer to the Bridlington Corporation. Mr. T. N. Young succeeded his father as Manager of the Epsom Water-Works.

During the year we have unfortunately had to record the removal by death of several gentlemen connected with water-works undertakings. They were Mr. W. B. Bryan, the Chief Engineer of the Metropolitan Water Board; Mr. W. E. Darwin, the Chairman of the South Hants Water Company, and a Director of the Antwerp Water Company; Mr. E. B. Ellington, the Chief Engineer of the General Hydraulic Power Company, and Chairman of the Hydraulic Engineering Company, Limited, of Chester; Mr. Walter Hunter, formerly the Engineering-Director of the Grand Junction Water Company, and the collaborator with Mr. R. E. Middleton in the carrying out of the Staines reservoirs scheme; Colonel Ellis H. Llewellyn, one of the Directors of the Bristol Water Company; Mr. E. Bindon Marten, formerly Lessee, and afterwards Engineer and Manager, of the Stourbridge Water Company—a position he retained till the undertaking was transferred to the Stourbridge and District Water Board; and Mr. Walter Young, the Manager of the Epsom Water-Works.

Rectangular v. Circular Reservoirs.

The current number of "Engineering" contains an article by Professor E. R. Matthews, Assoc.M.Inst.C.E., F.R.S.E., Chadwick Professor of Municipal Engineering in the University of London, upon "Service Reservoir Construction." In the opening portion he offers some remarks on rectangular and circular reservoirs, and points out that British engineers almost invariably adopt the former and Americans the latter shape. He gives the following as some of the advantages of the circular reservoir: (1) No angles occur, so that the reservoir wall can be built without a joint. This is a great advantage, for when there is leakage it often occurs at the point where the walls join. (2) The circular form is well adapted to withstand external earth pressure. (3) Large circular reservoirs are cheaper to construct than rectangular ones. Professor Matthews says one of the best examples that might be given of a circular reservoir is that known as the "Twin Peaks" reservoir at San Francisco. It has been built in reinforced concrete, which is an excellent material to use in structures of this kind, as it has the following advantages: There is a saving in first cost; a reservoir built in this material occupies less space than one constructed in masonry or brickwork, or a combination of both; it can more easily be made watertight; it increases in strength with age; there is less likely to be vegetation upon the face of the walls; and the cost of maintenance is practically *nil*.

GAS LEAKS AND BITUMINOUS PAVEMENTS.

The subject of the effect of leaking illuminating gas on bituminous pavements was recently dealt with in a paper read by Mr. G. C. WARREN before the American Society of Municipal Improvements.

The author began by stating that everyone who has had experience in the construction of bituminous pavement knows that gas escaping from the mains is very injurious. In order to test the effect on asphalt, he carried out a series of experiments, by the aid of apparatus which he described, from the 18th of August to the 15th of October last, with the exception of the Sundays and a public holiday. They showed that ordinary gas, without agitation, rapidly liquefies asphalt cement and refined asphalt, and destroys its value as a cementing medium; and also that it not only attacks the asphalt but combines with it, thereby increasing its weight. In order to show the rapidity with which asphalt cement will absorb illuminants from gas, the author designed apparatus to compare the brilliancy of two flames of identical size—one burning normal gas passed through a glass tube containing dry sand, and the other burning gas passed through a corresponding tube containing a sand-asphalt mixture. It was found that in the normal flame the blue portion was very small and the flame luminous, while in the other flame the blue portion was relatively much larger, and the flame itself of lower candle power.

Having shown the effect on the bituminous cement and on the gas of their contact with each other, the next step was to measure the effect on the bituminous material. This was done by filling a quart fruit-jar with liquid asphalt of 1 sp. gr., and using gas under high pressure. Two tubes were inserted—one for admitting the gas extending to the bottom of the jar, and the outlet-tube above the surface of the asphalt having a burner at the end. After twelve days' exposure to passing gas, the asphalt had increased 2·98 per cent. in weight and 4 per cent. in volume. The characteristics of this asphalt before and after exposure to gas were as follows:—

	Before.	After.
Specific gravity at 60° Fahr. . .	1·00	.. 0·99
Flash-point	190° Fahr.	.. 120° Fahr.
Engler viscosity—		
First, 50 c.c.	155 seconds	.. 75 seconds
Second, 50 c.c.	170 ,,	.. 90 ,,
Weight (increase 2·96 per cent.) .	855·1 grammes	.. 983·6 grammes
Volume (increase 4 per cent.) . .	955·1 c.c.	.. 993·5 c.c.

While asphalt and sand mixture were used in these tests, being more convenient than coarser bituminous mixtures, the author said it was not intended to claim that one bituminous paving mixture was more readily affected by gas exposure than another. In the author's thirty years' experience with asphalt and other bituminous pavement construction, this matter had, he said, come up many times; and he generally found that the gas companies claimed: (1) That it is ridiculous to suppose that gas will attack an asphalt pavement. (2) That the gas-mains have been carefully tested by plugging holes through the pavement and into the ground, and that there are no leaks. (3) When the main is on the side of the street opposite a portion affected, it is too far away. He commented on these points as follows:

1.—There can be no question that coal gas, being a hydrocarbon in gaseous, and therefore in its most penetrating, form, will attack any form of bitumen even more rapidly than oil; just as gasolene, being more penetrating, will attack bitumen more rapidly than heavier oils. I remember an aggravated case on West End Avenue, New York City, about fifteen years ago, where the asphalt pavement was ruined again within three months after it was re-surfaced; the gas company having claimed that they had thoroughly tested the mains and repaired the leaks. Shortly afterwards the company were obliged to entirely relay the main, and the pavement was again relaid.

2.—Even if they will not admit it, the gas companies know that the "plugging" test only sometimes locates the leaks. They naturally dislike to go to the expense of breaking-up and relaying pavements and excavating to the mains, unless they are absolutely required to do so.

3.—Leaking gas follows the lines of least resistance, which may be in either a nearly vertical line, showing the result almost immediately above the leak, or may follow a long distance through a vein of porous earth or along some old settled trench, and reach the pavement surface a long distance from the leak. In such cases the pavement is generally affected over a large area, because the earth has quite generally become saturated with gas, which gradually works up to the surface of the pavement.

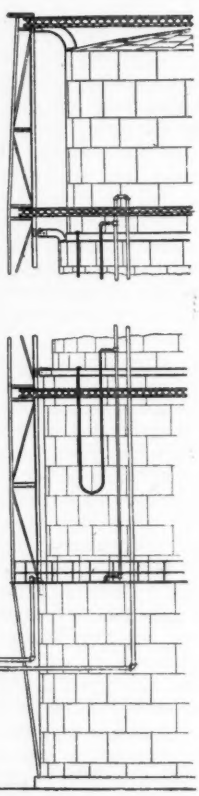
Frequently, if not generally, he added, the first indication of leak in the gas-main where the street has a bituminous pavement is the effect on the pavement. In this case it is good fortune that the pavement is of a character that is affected by gas, and will permit it to permeate the surface, thus lessening the chance of serious casualty. The visible effect of leaking gas on a bituminous pavement is a serious "shifting" or "rolling" of the pavement in its softened condition, accompanied by a breaking-up of the surface into a "crackled" appearance, not unlike the folds in an alligator's back. Generally, when this condition is noticed there will be a perceptible odour of gas. But sometimes the leak may have been repaired, or the gas have taken another course and escaped, so that its odour cannot be detected; yet the pavement is left in a seriously damaged condition. On the other hand, under certain subsoil conditions, the earth below the pavement may retain the escaped gas, and continue its damaging effect for months, if not years, after the main has been repaired.

The effect on the pavement may extend for a considerable period after the repairs to the main, unless vents are left open for several days, if not weeks, after repairs to the mains are made. In such cases, before repairing the pavement, its entire surface over the main and where it shows the effect of gas should be removed. After the leaks are repaired, openings at least a foot square, extending from the surface to the level of the main, should be left open for two or three weeks, if there is still any odour of gas, and the openings then refilled and the pavement surface relaid.

HEATING GASHOLDERS BY HOT WATER.

One of the papers read at the last annual meeting of the American Gas Institute was on "The Care and Maintenance of Gasholders;" the author being Mr. John H. Braine, of Brooklyn (N.Y.). An abstract of the paper was given in the "JOURNAL" for the 20th of October (p. 133), and it was there mentioned that a description was given of a hot-water heating system for gasholders, using the waste steam from the exhauster engines of a steam-driven pumping-station. The following is the portion of the paper referred to.

In many instances where hot water is used in gasholder tanks and cups, local conditions make large volumes of hot water available. In one instance, the condenser discharge from large turbine units leads to a 5 million cubic feet holder tank; the supply to the condensers being taken from the bottom of the tank, and hot water being in sufficient volume to preclude the necessity of using steam on the holder, except on the upper cups in very cold weather. Possibly the most common instance where hot water can be economically used is that of isolated steam-driven distributing stations, where there is a large volume of exhaust steam. One such installation is under the charge of the writer, and has so far worked satisfactorily. That shown in the accompanying illustration is used with two 5 million cubic feet five-lift steel-tank holders; the total engine capacity being about 1100 H.P.



Installation for Heating Gasholder Cups.

The economy of such a system depends upon the quantity of exhaust steam available, the distance the hot water must be moved, the type of holders, the condition of the cups and tanks as to the possibility of good circulation, and the character of the gasholder water (whether clean or otherwise). The apparatus and piping used in this installation are: 1000 H.P. open type heater; two 10 inch by 6 inch by 12 inch single-acting pumps; an 8-inch back-pressure valve; a 10-inch exhaust-steam inlet; a 4-inch cold-water inlet; and a 4-inch hot-water discharge.

Exhaust steam from the engines passes through the closed heater A (which was already in use at the time of installing the open heater), and from there into the open heater B. If necessary, the closed heater may be bye-passed through the line C. A back-pressure valve D is inserted in the outboard exhaust, set to open at about 3 lbs. pressure. The heater B is supplied with cold water from the line E, which syphons the supply from the holder tank as shown. The cold water from this tank, heated by the exhaust steam, is discharged by the pumps F into the riser G. This riser is carried up above the highest cup, and the cup connections are made to the return line as shown. The object of this is to provide a uniform supply of water to all the cups. If a single riser is used, the lower cups will rob the upper ones, unless the valves are throttled to such an extent that they are easily obstructed by foreign matter in the water. The return riser terminates in

the tank syphon, which is only used in severe weather, as it has been found that the tank water receives sufficient heat from the overflow of the cups. If at any time sufficient steam is not available to keep the water issuing from the open heater at 210° Fahr., high-pressure steam may be admitted into the heater through the line H. The cold-water supply line E should have an indicating thermometer, and the pump discharge G a pressure-gauge and recording thermometer. The pumps should have stroke counters and pump regulators. From the available data [see below], this system has shown marked economy over the use of high-pressure steam.

Tank.	Sections.	Capacity of Holder (Cubic Feet).	Number of Jets.	
			Tank.	Cup.
Steel . . .	Three	500,000	1	1
Brick . . .	Two	1,000,000	..	1
Steel . . .	Three	1,500,000	1	1
Steel . . .	Four	3,000,000	2	1
Steel . . .	Five	5,000,000	2	1
Steel . . .	Five	10,000,000	2	2

Type and Size of Jets.				Average. Boiler Horse Power.	Size of Feeds.	
Tank.	Size (Inches).	Cups.	Size (Inches).		Hor. Headers (Inches).	Risers (Inches).
Syphon	¾	Syphon	¾	..	1	¾
..	..	,,	¾	..	2	¾
Syphon	1¼	,,	1	..	2	¾
,,	1¼	,,	1¼	38	2	¾
,,	1¼	,,	1¼	..	2	¾
,,	1¼	,,	1¼	80	2	¾

Spare risers are provided on the large holders; but the necessity for their use has been so infrequent that the preceding figures may be said to represent fairly the average conditions.

COMMERCIAL SIDE OF THE GAS INDUSTRY.

In another part of the "JOURNAL," a general account is given of the proceedings at the tenth annual meeting of the American Commercial Gas Association, held early this month at Minneapolis, under the presidency of Mr. P. S. YOUNG, of Newark (N.J). The following are some extracts from his address.

THE WAR AND THE GAS INDUSTRY.

No one can foretell the economic effects of the European War now being waged. We know that tremendous sums are being wasted, that vast numbers of men are being withdrawn from productive employment, and that great destruction of property is occurring. On the other hand, the forces of economy are now causing the accumulation of capital elsewhere, and the resources at the command of man to-day are so great that it may be that the world will recover, in much less time than now seems possible, all that it is losing, and again go forward in the march of civilization faster than ever before.

The economic and financial disturbances resulting from the war have caused the industries of America to pause in their progress. Their development has been rapid, but none the less sound for the most part, though it has been evident that some of the industries which economists have been accustomed to consider as subject to the law of increasing returns, are now apparently subject to the opposite law. Public utilities have been thus classed; so it is of great importance that the public should be taught to recognize the conditions that have brought about this change. The operation of utilities has been said to be governed by the law of increasing returns, because the application of additional capital brought more than a proportionate increase in product and return on investment. But the constantly increasing cost of capital, material, and labour the last fifteen years has changed the situation completely. There is, therefore, less reason for believing that base prices for gas to the consumer can be reduced in the future, than that they will remain stationary or must be increased.

Probably gas companies are affected by war conditions the least adversely of all public utilities. In common with other soundly-managed institutions, they have carefully reviewed their resources, obligations, and business opportunities under present conditions. They are fortunate, in such times as these, in supplying a household and commercial necessity, in the great number of their customers, and in the diversity of the uses to which their product is put.

DEVELOPMENT OF BUSINESS.

Gas plants can be operated without as large outlays of new capital as other utilities; and it remains for their operating and commercial men to employ their talents to meet the emergency. Especially to the commercial man does the emergency appeal. He must develop intensively the business of his company—striving first to bring in the business which requires the least proportionate outlay of capital, and generally to stimulate the greatest diversity of uses of gas in the community by methods that will enhance his company's reputation for business sagacity and enterprise. This Association should never lose sight of the great importance to its membership of the study and development of selling methods. Its concentration on this work is one of the chief reasons for its success and its present influence. New markets cannot be gained overnight; careful preparation is required. A study of the needs of prospective customers is essential. Our product must be delivered to suit our customers' convenience. Habits and customs will not be changed to suit the seller. Our aim must be to make our service adaptable to the needs of the customer at rates that are fair and just.

GAS FOR FUEL, LIGHT, AND HEAT.

At the mid-year meeting of the Association a most instructive series of papers on industrial fuel topics was discussed in separate session. It is hoped that before the end of another year the Association will have an industrial fuel expert, to assist the smaller companies in developing this business, and to gather and collate information now scattered and not generally available, and so enable every situation to keep in touch with all developments in this important field. The work of such a man would be largely self-supporting, for requests are often received for such service.

Many presidential addresses have emphasized the importance of the lighting business. The earlier Presidents characterized the attitude of gas companies towards it as one of neglect. It is reassuring to be able to say that such a word cannot be used to describe the situation to-day. The field is not neglected; but is it being properly developed? There seems room for increased activity. The advantages of gas lighting are apparent. Such favourable qualities as its competitors possess are surely balanced by its advantages. The situation only requires aggressive action on the part of gas companies to preserve and increase this business. Nor should it be lost sight of that the use of gas for lighting stimulates its use for other purposes.

The use of gas for heating is a field of vast possibilities. Conditions are making the marketing of gas for this purpose more and more feasible. The cost of labour and other fuels is continually increasing, and conditions in cities tend to make the use of solid fuels objectionable. The recognition of the desirability of radiant heat is becoming more general; and the increase in the wealth of the community is increasing the market value of convenience. If conditions continue to move in the same direction, and the development of gas-heating appliances continues to make the same progress as in the last few years, it is safe to predict that we are on the threshold of a great increase in the use of gas for heating.

Applications of Tar and its Derivatives.

This subject was dealt with by Herr Kayser in a recent issue of the "Journal für Gasbeleuchtung" [Vol. 57; 1914]; and the following abstract of his article appears in the current number of the "Journal of the Society of Chemical Industry." Owing to the large amount of benzene, required for use in dye manufacture, recovered in the production of coke in coke-ovens, new outlets are necessary for the tar and its derivatives produced in gas-works. The use of tar oil in furnaces and engines is one of these outlets. In furnaces the oil should be supplied under pressure, and then broken up by air streams. The advantages of tar oil in furnaces are smokeless firing, simplicity of working, and cheapness. Tar oil is used in Diesel engines; and Körting's have plant of 500 H.P. running with tar from vertical retorts. This works as well as a tar oil installation, while the cost of fuel is less. But a special starting means is necessary. Tar is in demand for road making and for coating wood, &c., especially in roof work. Pitch is used in the coal-briquetting industry. Separate works for the distillation of 175 to 200 tons of tar per annum are not profitable; and combined working of such outputs should be resorted to. Both continuous and discontinuous distillation processes are used. A continuous plant of Herr Hirzel comprises a raised reservoir into which tar is pumped, and then flows through a vertical chamber having horizontal baffles and heated to 180° C. to drive off water and light oils. It afterwards passes through a series of three stills, placed side by side and stepwise. In the first medium oils are driven off, in the second heavy oils, and in the third anthracene—the pitch being drawn off through a cooler into pits. The distillates are passed through condensers into reservoirs. In the discontinuous process a vertical retort is usual; the means for driving off water and light oils being the same as in the continuous process. Pitch is suggested as an alternative to cement for building purposes.

Nomenclature and Standards.—At a recent meeting of the Committee on Nomenclature and Standards of the Illuminating Engineering Society (U.S.A.) a resolution was adopted giving as the opinion of the Committee (*a*) that the output of all illuminants should be expressed in lumens, (*b*) that illuminants should be rated upon a lumen basis instead of a candle-power basis, and (*c*) that the specific output of electric lamps should be stated in lumens per watt, and the specific output of illuminants dependent upon combustion should be stated in lumens per British thermal unit per hour. The resolution has been approved by the Council of the Society.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Imports of Gas-Mantles from the Continent.

SIR,—I note that you have had a communication from a correspondent in Holland, who refers to my complaint made at the meeting of the Society of British Gas Industries, that mantles were being imported into Holland for transit to this country under Dutch colours.

Your correspondent states that this is a matter the discussion of which is entirely fruitless when one remembers that there are British Consuls both in Amsterdam and Rotterdam. In his eyes, such a discussion may be fruitless; but I venture to say that it is no such thing with the British public.

There has been published a record of the values of German mantles passed through Holland to this country, and showing an increase week by week from Oct. 3 until Dec. 5. The weekly import increased by leaps and bounds. Commencing with £257 on Oct. 3, it increased to over £1000 during November, and to close upon £2000 during the first week in December.

Your correspondent's letter would have been more satisfactory had he shown his *bona fides* by signing it with his own name.

Manchester, Dec. 24, 1914. THOS. G. MARSH.

[Regarding Mr. Marsh's last remark, we can assure him and our readers generally that the correspondent in Holland to whom he alludes has no connection, in any way whatever, with any trading concern (in mantles or gas-works requisites of any kind) on the Continent. —ED. J.G.L.]

"Undue Preference" in Electric Lighting.

SIR,—In your Dec. 15 issue, the editorial notes on "Undue Preference" in electric lighting are so much to the point that I would like to supplement them by calling attention to a remark made by Lord Justice Kennedy in our recent appeal case.

Counsel against us had been suggesting various instances of imaginary "reasons" for giving preference, when his Lordship said:

> "What the legislature does is not to allow that commercial element to come in, so as to differentiate between people; because in giving you certain statutory powers they think it is right to protect persons of all kinds from having purely commercial reasons thrust upon them."

This extract from the verbatim report is rather fuller than is printed in your issue of Nov. 3, p. 250. Both gas and electricity administrators are thus most clearly told wherein they differ from any ordinary trading concerns not under statutory authority.

Long Eaton, Dec. 21, 1914. G. STEVENSON.

REGISTER OF PATENTS.

Producer Gas and Power Installations.

LYMN, A. H., of Sanctuary House, Westminster.

No. 27,922; Dec. 4, 1913.

This invention relates to installations in which producer gas is made (with or without the recovery of ammonia or other bye-products) and utilized for raising steam for driving an engine or turbine.

The inventor points out that his object is to provide an improved system of apparatus by which the steam can be utilized and the power plant driven more economically and efficiently than has been the case in installations of this kind as heretofore proposed; and it is especially intended for use in cases where bye-products are recovered, but is by no means restricted to such cases "for it can be very usefully employed in cases where no bye-products are recovered."

It is well known, he says, that in such installations it is necessary to introduce steam into the producers, especially where bye-products are to be recovered; and in order to obtain a good yield of the chief bye-product of such plant—namely, ammonia—large quantities of steam are required, which steam has heretofore been raised especially for the purpose in gas or coal-fired boilers, while high-pressure steam or electric current has generally been used to drive the auxiliary machines or apparatus of the system or installation. But this method of operation involves considerable expense, which in most cases renders it unprofitable to fire the boilers of steam-power plants by producer gas. Moreover, in such systems the engine or turbine (or one or more of the engines or turbines where several are employed) is sometimes run as a non-condensing machine, the exhaust steam therefrom being fed to the gas-producers. But in such a case high-pressure steam or electric current has to be used for the blowers and other auxiliary machines. It has also been proposed to withdraw the steam at some point in the engine or turbine where the pressure is from 2 lbs. to 3 lbs. above that of the atmosphere; but such steam cannot be used for driving the auxiliary apparatus, which latter have accordingly to be separately provided with steam at high pressure or electric current.

According to the present invention, steam is withdrawn from the engine, turbine, or other principal motor at a point at which it still has sufficient pressure to drive the auxiliary apparatus of the installation, and after driving it is caused to exhaust into the gas-producers. The steam thus withdrawn may also be used for driving the auxiliary machines of the principal motor—such as pumps for the condensing plant, or the like—and may exhaust thence into the gas-producer. By this means there is provided the steam necessary both for driving the auxiliary machines and for supplying the producers, "but without causing serions loss of power to the engines or turbines."

The invention [which is not illustrated in the specification] is intended primarily for use in connection with steam-turbine plants; and in carrying it into practice it is preferable to employ for the blowers or other auxiliary apparatus an engine which is "specially designed to be run at the lowest practicable pressure." For which purpose, the patentee says, he has found a pressure of at least 15 lbs. above atmospheric to be suitable. Arrangements should also be made to ensure that the low pressure and condensing parts of the engine or turbine will use, as efficiently as possible, the reduced quantity of steam.

Concluding the specification, the patentee remarks: "By means of my invention it will be possible in many cases to run profitably steam power plant with producer gas plant, with or without bye-product recovery, which otherwise would be uneconomical."

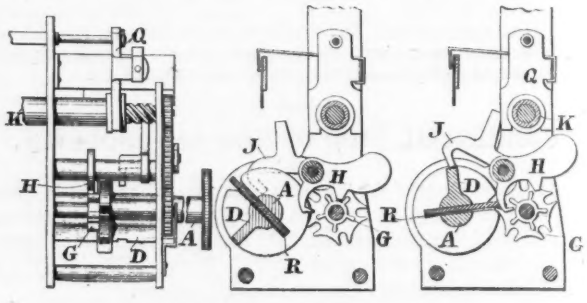
Prepayment Gas-Meters.

TREEN, J. C., South Metropolitan Gas Company, Old Kent Road, S.E.

No. 28,038; Dec. 5, 1913.

This invention has for its object the prevention of fraudulent manipulation of the mechanism which determines the quantity of gas paid for—for example, mechanism of the kind which embodies a notched wave-wheel (a geneva wheel) and a disc for locking it. The inventor proposes to employ, instead of an ordinary pawl engaging with one of the notches, an escapement crutch co-operating with an escapement wheel attached to, or connected with, the geneva wheel. A wire inserted to disengage the escapement will, in disengaging one limb, engage the other—thus "an efficient safety is provided." The arrangement is such, however, that the coin is able to move the crutch and at the same time engage the geneva wheel and move it a step in the ordinary manner.

The illustration shows so much of the meter mechanism as will serve to illustrate the invention—in back view and two sections, with the escapement in different positions.



Treen's Prepayment Gas-Meter.

In operation, when a coin R is placed in the coin-carrier and the spindle A is turned backwards (away from the operator standing in front of the meter) the coin first lifts the pawl J, which cannot be lifted after the complement of coins has been paid in until some of the gas paid for has been consumed—the reason being that when the sleeve K is fully to the right a projection on the carriage Q, which is moved by the sleeve, interferes with the pawl and prevents it being raised to clear the web D. The coin having passed the pawl J, the latter prevents it from being returned. The continued rotation of the coin-carrier causes the coin to engage with one of the slots of the geneva wheel, at the same time releasing the escapement device H G, by which the geneva wheel is controlled. The further rotation of the coin-carrier turns the geneva wheel far enough to permit the supply of a predetermined quantity of gas in the manner already understood.

The escapement crutch H has in the first arrangement its back limb in engagement with the escapement wheel G. In the second the front limb of the crutch is in position to engage. These are the positions which the crutch assumes before and after the coin comes into operation; and with this escapement it is not possible to tamper with the mechanism. Disengagement of one limb of the crutch by the insertion of a wire will only result in the engagement of the other.

The position of the web D on the carrier spindle is, moreover, of assistance in preventing the insertion of a wire in any circumstances. The coin-carrier cannot be turned back with the coin still in it with a view to engaging a fresh slot in the geneva wheel. Only one step of the gas-supplying device can be procured for one payment.

Heating Coke-Ovens, Gas-Retorts, &c.

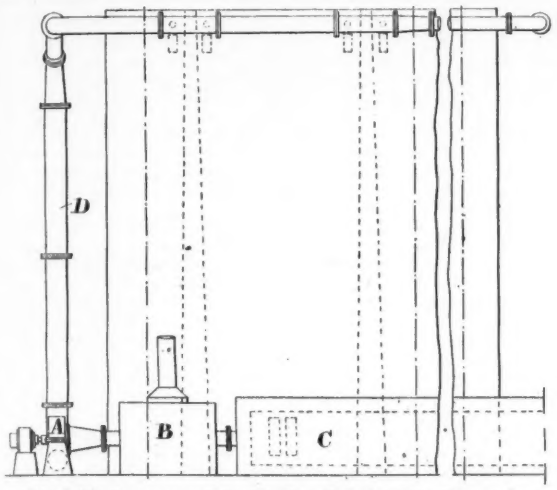
WOODALL, H. W., of Poole, Dorset.

No. 3363; Feb. 9, 1914.

This invention relates to "a method of overcoming certain difficulties which present themselves in heating a gas-retort, coke-oven, or the like, by the combustion of the volatile products of carbonization, and consists in diluting the products or the purified products with waste flue gases before they are burnt in the heating flues of the oven or retort. One difficulty overcome in this manner resides in the tendency for local overheating and deposition of carbon when a gas like coal gas of high calorific value is burnt under ordinary conditions in the heating flues." Another difficulty overcome will, the patentee states, be appreciated by the following statement: Coke-ovens, gas-retorts, &c., may be heated either by producer gas or by the gases, or a portion of the gases, produced by the carbonization in the retort or oven. Producer gas being of different quality from oven gas or retort gas, the construction of burners and heating flues adapted for this gas is not suitable

when oven gas or retort gas is used. Nevertheless it is frequently desirable that the same installation should be capable of operation with either class of gas, and many attempts have been made to render an oven or retort which is suitable for being heated by producer gas, readily adaptable for being heated by oven gas or retort gas.

The present invention, he remarks, solves the problem by making provision whereby waste-flue gases may be readily mixed with the oven gas or retort gas so as to lower the quality of the latter to about that of producer gas. The gas thus diluted with waste gases may be burnt in the burners and flues of an oven or retort constructed to consume producer gas, without adaptation or with a minimum of adaptation. A simple arrangement for the purpose consists in a communica-



Woodall's Arrangement for Heating Retorts, Coke-Ovens, &c.

tion between the waste-gas flue of the retort or oven and the main which conducts gases from the oven or retort or the purifying plant to the heating flues, and a device whereby gas from the waste-gas flue is drawn or forced through such communication into the main.

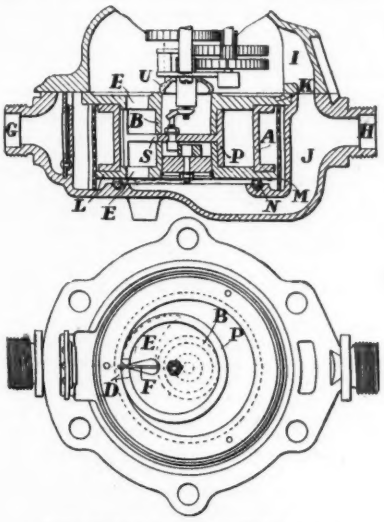
The accompanying diagrammatic representation (in elevation) of a setting of vertical gas-retorts shows an arrangement of the kind referred to. By means of a fan A products of combustion are withdrawn through a cooling chamber B from the main waste-gas flue C, and are delivered through the pipe D to ports in the flues at the top of the setting through which the retort gas passes on its way to the heating flues, where combustion occurs in the downward direction.

Rotary Piston Meters.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ, and FRAGER, A. J., of Paris.

No. 12,040; May 15, 1914.

This invention relates to fluid meters of the rotary piston type, in which the inlet and outlet openings in the piston box or chamber consist of an opening in the upper plane and an opening in the lower plane, on one and the same side of the diaphragm, for the inlet or outlet, and a slot in the cylindrical body on the other side of the diaphragm for the outlet or the inlet. The employment of such openings dispenses with



Frager's Rotary-Piston Fluid Meter.

all coring in the body and ends of the chamber containing the piston; but in meters of this kind as at present constructed, direct passage occurs between the inlet and outlet at several positions of the piston. The outline of the openings in the planes, and the guide slot of the piston, which form the subject of the present invention, it is said, obviate this leakage, whatever the position of the piston may be.

The measuring chamber, as shown, is formed essentially by the cylindrical box A (turned or machined internally), the cylinder B similarly treated externally, the two ends K and L, and the diaphragm F. In the space thus determined the slotted cylinder P moves with its outer surface remaining tangential to A and its interior surface tangential to B—the edge remaining in contact with the diaphragm F. The piston P carries a partition, web, or projecting edge S to strengthen it), likewise slotted to permit of the passage of the diaphragm F during the movement of the piston.

The box A is slotted at D parallel to its generatrices at a slight distance from the diaphragm F; and the two ends K and L of the piston box are formed on the other side of the diaphragm with openings E. To obviate giving too great a thickness to A, while nevertheless avoiding any deformation under the pressure of the liquid, there has been a construction of casing adopted such that the entire outer surface of A supports the same pressure.

For this purpose the inlet union G communicates, through a cylindrical filter M, with an annular chamber surrounding the piston box. The outlet union H, on the contrary, communicates by two conduits I and J with two chambers arranged respectively above and below the ends K and L. To avoid any communication between the inlet and the outlet, there is arranged under the piston box an annular joint N compressed by the lower face of the box, and at the upper part of the box an elastic obdurator U carried by the spindle of the train.

The guiding of the piston and the transmission of its motion to the train of gearing are effected by any well-known means.

APPLICATIONS FOR LETTERS PATENT.

24,093.—PIPER, E. J., "Acetylene generators." Dec. 15.
24,119.—BROWN, W. L., "Fluid meters." Dec. 15.
24,140.—JACKS, T., "Mantle supports." Dec. 16.
24,149.—HUTCHINSON, B. G., "Prepayment meters." Dec. 16.
24,154.—APPLEBY, E. G., and WELLS, J. F., "Low-temperature distillation retort." Dec. 16.
24,156.—CARS, B., and PALMER, W. D., "High-pressure gas-lamps." Dec. 16.
24,172.—WATSON, F. M., "Strainers for water-meters." Dec. 16.
24,246.—VALENTINE, H. S., "Gas-fires." Dec. 18.
24,289.—DUCKHAM, A. M'D., "Ventilation of retort-houses." Dec. 18.

APPLICATION TO AVOID OR SUSPEND AN ALIEN ENEMY PATENT.

3876 of 1905.—Grantee, IMRAY (JULIUS PINTSCH), "Inverted incandescent gas-lamps." Applicant, W. M. STILL AND SONS, LTD.

James Milne and Son, Limited.

The annual meeting of the shareholders of James Milne and Son, Limited, was held yesterday week, at the Company's Edinburgh offices. A much more satisfactory report was submitted than in recent years; and, although the firm have not yet reached the dividend-paying stage, the amount of loss against the year's working is much less, and the prospects of the future more hopeful.

Plymouth Corporation Water Engineer.

The Plymouth Town Council at their last meeting dealt with a number of matters arising out of the amalgamation of the towns of Plymouth, Devonport, and East Stonehouse. A Special Committee had considered the question of the re-organization of the staffs of various departments, and, among other changes, recommended that Mr. F. Howarth, the Water Engineer of the Plymouth Corporation, be appointed Water Engineer for the enlarged borough, at a salary of £650, and that the office of Water Engineer for Devonport (held by Mr. F. W. Lillicrap) be abolished. Mr. Lillicrap wrote to the Special Committee regarding his appointment; and, as the result, a resolution was passed stating that the Committee were unable to depart from the terms of the Parliamentary Order in relation to the matter, but that, having regard to the whole circumstances, and the extra work attending the amalgamation of the water undertakings, the sum of £300 be paid to Mr. Lillicrap for the services to be rendered by him in connection with the compilation of the necessary detailed information as to the Devonport undertaking. The Mayor explained that the effect of the recommendation would be a saving of £155 in the salary of the Water Engineers. Previously Mr. Howarth was paid a salary of £500 and Mr. Lillicrap £425. Mr. Howarth would now receive £650, and Mr. Lillicrap would be paid £120 compensation. The Council adopted the recommendation without further comment.

Westbury Gas Company.—In the report of the Directors which was adopted at the annual meeting of the Westbury Gas Company (on the proposition of the Chairman, Mr. H. W. Mead), it was stated that the income from sales of gas during the year exhibited a falling off of over £200, owing to the loss of two large consumers. Residuals had also realized less. The Board recommended the payment of a dividend for the half year ended Sept. 30 at the rate of 7 per cent. per annum on the original capital and £4 18s. per cent. on the new capital. Mr. Norton H. Humphrys (the Managing-Director) pointed out that, though there was a decrease of income, there had also, in spite of advanced prices of coal and materials of all kinds, been a decrease of expenditure, which had been secured by careful economy in every department, with the result that they had fairly earned the dividend on the year's working. A recent important improvement in the purifying plant consisted of the erection of a Cockey washer of the latest type, which was an entire success.

LEGAL INTELLIGENCE.

THE SOUTH METROPOLITAN GAS COMPANY AND ILLEGAL CHARGES BY THE SOUTH LONDON ELECTRIC SUPPLY CORPORATION.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(*Before Mr. Justice* EVE.)

Monday, Dec. 21.

Attorney-General (At the Relation of the South Metropolitan Gas Company) v. South London Electric Supply Corporation.

In reference to this case—reported in the "JOURNAL" for the 15th inst., p. 619—his Lordship this morning had a further application made to him. It may be remembered that at the former hearing the Gas Company were granted a declaration to the effect that the Electric Corporation had illegally allowed certain of their customers a rebate of ½d. a unit, provided they used only electricity as an illuminant.

Mr. WHEELER, now appearing for the Gas Company, said his Lordship, after making the declaration about a breach by the defendants of the Electric Light Act, 1882, gave the plaintiffs liberty to apply for an injunction if necessary. The Registrar, however, had declined to put this condition in the order, for what reason he (Counsel) did not know, except that he said it was a final judgment. The same point arose in the Long Eaton case; and there Mr. Justice Sargant made a declaration, and gave liberty to apply for an injunction if necessary.

Mr. TYLDESLEY JONES, for the defendants, said he had not raised any objection to the order being drawn up in the form pronounced.

His LORDSHIP said the order must be drawn up with the words "liberty to apply" inserted in it.

Dispute over a Gas-Engine.

At the Keighley County Court, last Wednesday, His Honour Judge Graham, K.C., delivered judgment in a case in which Arthur Keighley, an engineer, sued Charles Greenwood, a farmer, for £100, the price of a gas-engine and its fixing. The defendant counterclaimed for £23 for loss sustained through the engine not working properly. His Honour said that the contract was apparently nothing more than a verbal one; and it was to the effect that the engine should give 15 B.H.P., which plaintiff said it would do. In his opinion, on such a contract, this meant that the engine should not merely be capable of developing 15 B.H.P., but should be capable of doing so regularly, whenever it was required; so that the mere fact that the engine had developed it for two or three hours, was not sufficient to prove that it complied with the contract. It was clear to him that the engine-bearings became far too hot for it to be safely run after going for two or three hours; and the reason for this was quite obvious. The centre-line of the cylinder, when prolonged to the crank, would be found to be actually 15/33 of an inch out of place. On this ground alone he would have found the defendant was justified in rejecting the engine. There was, however, a further want of alignment; and in putting the engine together the bearings of the connecting-rod at the gudgeon end of it had been made shorter than they should have been. His Honour held that the engine did not answer to the contract, and gave judgment for the defendant on the claim, and also on the counterclaim for £5.

Theft of Gas by a J.P.

Before the Sheriff at Cupar, Robert Suttie, of Kennoway, pleaded guilty to having stolen, between January, 1908, and December, 1914, gas valued at £20, the property of the Leven and Methil Gas Company, and was sentenced to three months' imprisonment. Defendant, who was recently appointed a Justice of the Peace, was for various periods a member of the Buckhaven Town Council, the Wemyss Parish Council, and the Wemyss School Board. On his behalf, his Advocate pleaded that he should not be made to "dree his weird" further in prison, but should be given the benefit of fine. In extenuation, he said the crime did not truly express the character of the accused. He was the owner of the Town Hall of Methil. In 1907, he let the hall to a theatrical manager for six months, and intimated to the Gas Company so that they could collect from the tenant the amount of gas consumed. The tenant went away without paying any rent, and leaving an unpaid gas bill for £40. The Company claimed payment from the accused; but he denied liability. The Company cut off the supply of gas; and as there was at the time a demand for the use of the hall accused, to save himself further loss, paid the account. While smarting under what he considered an injustice, he committed this crime. Alterations were in progress upon his house; and it was suggested to him that he might get even with the Company, and take in gas to a fire from the main. The Sheriff said the offence was apparently premeditated. He wished to make the punishment as lenient as possible; but he could not see his way to make it less than three months' imprisonment.

Bilston Gas Company.—The Directors' report which will be presented (with the accounts for the year ended Sept. 30) at the forthcoming annual meeting, states that the profit and loss account, after paying the usual interim dividends, shows a credit balance of £14,654. It is proposed to pay further dividends of 5s. 6d. per share on the "A" shares and 4s. on the "B" shares—making 11s. and 8s. per share respectively. This will leave a balance of £11,969. This financial year it is proposed to pay dividends free of all income-tax, as hitherto; but next year, in view of the recent increase in taxation, this, the Directors remark, will not be possible.

MISCELLANEOUS NEWS.

DIRECT AND INDIRECT RECOVERY.

By ERNEST M. MYERS.

[A Paper read before the Sheffield University Gas and Coke-Oven Students' Association.]

In choosing the subject for my paper this evening, I was rather at a loss to determine on what lines I should proceed, in order to place before you as accurately as possible the problems underlying all that comprises what is now known to coke-oven people as the "direct process." So much has been written, and such a great deal has been said, on the subject that perhaps it would be invidious on my part were I to attempt to discuss the matter from a purely critical point of view. In these circumstances, I therefore came to the conclusion that an examination of both "direct" and "indirect" recovery would be more conducive to an interesting discussion, which I hope will ensue when I have finished my paper, and which is one of the main reasons which prompted me in my choice of subject.

I think—and I believe more or less rightly—that our starting point should be this salient fact—a fact that we impress on the minds of our students in the early stages of their studies relating to coal—that coals from different districts, and even in some cases those in the same district, are so unlike in their properties and in the products which they yield, that each requires special consideration. I trust you will forgive my mentioning this point; but I place very considerable weight on it, though I am afraid that it has often been lost sight of. Until we are prepared to concede that, when we deal with coal, we deal with a very complex body—so complex that it is little understood—we lose the very foundation on which we are to build our subject. It is a well-known fact that some coals require less compression than others in order to yield a saleable coke; others require none at all; and while some coals give a reasonably good coke when carbonized at a moderate temperature, others at the same temperature yield a coke at which no blast-furnace manager would look. Yet as soon as the temperature is increased the resultant coke is excellent.

CHARACTER OF BYE-PRODUCTS FROM DIFFERENT COALS.

Again, it is not out of place in a paper of this kind to say that the character and yields of different bye-products from different coals vary tremendously. Where the tar from one coal contains practically no naphthalene, the tar from another contains practically no oil, and instead yields nearly all solid products; where the amount of hydrochloric acid in one coal is so negligible as never to cause the management one moment of anxiety due to corrosion of oven linings or hydraulic main troubles, the same agent in another coal is present in such quantities as to give rise to continual trouble. I could go on giving examples of the different properties of coals which you yourselves in your daily routine know to be existent. It, therefore, requires no great stretch of the imagination or principle to definitely state that coal is so very complex indeed, and varies to such a large extent, that different treatment is required at practically every colliery or coke-oven works. This important fact is emphasized very many times at those works where they are compelled to purchase coal from two or three, or even more, sources. Having said so much, I think you will agree with me that the person must indeed be very bold who can definitely say what will happen at any particular works installing any kind of process for bye-product recovery, using the oft-heard statement that "it has worked excellently at such and such a place, and ought to work well here."

The next important fact is this (and it is again one which is impressed on us in the early studies of carbonization), that the whole success of either the direct or indirect process is made or marred in the carbonizing process. Such items as "pull on the ovens," temperature, circulation in the hydraulic main, &c., are important factors to which I will return later.

KIND AND QUALITY OF TAR.

The root principles underlying the direct recovery of ammonia have been separated into two different schools of thought—one advocating the hot recovery of tar (more truly the direct-recovery process), the other favouring the cooling of the gases and then reheating, a semi-direct recovery process. Both systems, however, pass the hot gases through saturators, and, of course, cool down for benzol recovery. The main difference then lies in the fact that the tar in the semi-direct process is recovered, as in the old indirect system, by cooling and some form of tar-extractor like the Pelouze or Livesey or similar type; while the tar in the direct recovery is taken from the gas while hot, without any cooling.

At this stage, it will be wise for us to examine the kind and quality of the tar that would be obtained from the gases before they enter the saturators on a plant where both systems of direct recovery were working. On the one hand, in the semi-direct process the whole of the condensed tar, *plus* that removed by friction would be composed of the same constituents as if obtained in an indirect plant. It would contain the naphthalene, light oils, &c., as in an ordinary gas-works; but, on the other hand, the tar which we should get thrown down in the hot process would be entirely different. Firstly, owing to the higher temperature, only the heavier boiling fractions would be taken out; and, secondly (a most important point), this tar would contain practically no naphthalene—the temperature being sufficiently high for a large portion of this substance to remain in the gas.

WATER VAPOUR.

Then, again, the gas entering the saturators on the semi-direct plant would contain less water vapour than that of the direct plant, because of the cooling down in the first process. The only addition of water that would be made to this gas would be that from the ammonia still, which is used for distilling the liquor obtained in the condensers. But

with a judicious use of a dephlegmator this could be reduced to a minimum.

The question of water vapour content in the gas is rather important, for the reason that, unless the heat of reaction between the ammonia and acid is sufficient to prevent further condensation in the saturator, external sources of heat must be sought for. The higher the water-content, the greater must be the quantity of heat supplied, so that the "bath" must not be allowed to become weak. Let us linger at this point a little longer. I have just mentioned the fact that in the semi-direct plant recourse must be had to an ammonia still in order to drive off the ammonia from the condensed liquor. What does this condensed liquor contain? It contains the whole of the fixed ammonia salts and a small percentage of free ammonia which has dissolved out in this liquor. These fixed ammonia salts are mainly ammonium chloride, which is a valuable product, and is certainly worth more per unit of ammonia than the salt into which it is being converted. On the face of it, this method looks very unwise, as we have a solution of a salt which is more valuable than ammonium sulphate, requires only obtaining as such, no acid or lime being necessary; yet we seek to split it up by lime and then use sulphuric acid to convert it into sulphate.

Ammonium Chloride.

Of course, there are several factors which govern the production of ammonium chloride. There are the considerations of the market, which are fairly considerable, due mainly to the existence of a ring; and there are the difficulties attendant on the manufacture of a saleable salt. Neither of these facts is a deterrent, and it is quite possible to obtain the whole of the ammonium chloride present in coke-oven gas as such. Now what happens to these fixed ammonia salts in the truly "direct" process or "hot" method? In some systems it is allowed to pass forward with the gas into the saturators, where it is decomposed with the liberation of hydrochloric acid. The resultant sulphate contains a fair proportion of ammonium chloride, and liberated acid has a very deleterious effect on the saturator linings. In other systems it is recovered from the hot gases by spraying with water, which is used over and over again until the solution becomes strong enough for further treatment.

In these systems the gases enter the saturators practically free from chlorides, and no liberation of hydrochloric acid takes place. As to the working of the actual saturators there is very little difference in any system. The design, of course, differs from the ordinary type used in connection with an ammonia still. In this type the ammonia is distributed by means of a cracker pipe—a perforated pipe which allows of free contact with the bath. In the direct system, the gas is forced through a curtain containing slots; the seal in the saturator being kept at a predetermined level. The bath is made-up to the desired strength or Twaddel, and the liquor is kept constantly circulated until, after the point of saturation is reached, the sulphate can deposit in some suitable receptacle; the bath being then made-up to the original strength.

Condensation and Naphthalene.

We will pass on now to the subsequent travel of the gases, though I shall return to the actual working of the saturators when I come to make a comparison of the two systems. I may say, though, in passing, that the quality of the sulphate produced by either the direct or semi-direct process is good and perfectly white; so that, as far as tar extraction (or, I should say, tar contamination) is concerned, neither system has any advantage.

After the removal of the ammonia from the gases on our semi-direct plant, they will be cooled in suitable condensers down to the temperature favourable for benzol recovery—not over 20° C.; and the character of the condensate will be water containing a small amount of ammonia. The gases from the direct process, when led into the condensers, immediately deposit naphthalene and light oils, which have been carried forward in the gas from the tar-extractors, owing to the high temperature of the latter. You can easily see that here we have a very troublesome body; for in the limited space of our condensers we have thrown-down practically the whole of the naphthalene in the gases. There are several ways of combating this difficulty. One is to cool the gases by passing them up towers and meeting a heavy spray of cold water pumped under pressure, whereby the gases are cooled and the naphthalene beaten out; the water and naphthalene passing forward to a suitable tank or pond, where the naphthalene can be separated.

Another system is to spray the gas in the coolers with creosote oil; the oil acting as an absorbent for the naphthalene. This is only efficacious in the hotter portions of the cooling plant; for when the warm naphthalenated oil has become saturated, it can be allowed to cool and deposit its naphthalene, and then be used over again. Yet another system is to have a duplicate cooling plant, so that when one gets choked up, the clean plant can be switched on, and then the blocked coolers steamed-out—providing that the naphthalene can be recovered as a marketable product. As to the actual recovery of the benzol, we are not immediately concerned, save to say that, once the gas is cool, neither system can claim any advantage in benzol recovery. The only essential difference between the two systems is the fact that in the semi-direct plant the amount of naphthalene going forward to the benzol scrubbers will be small compared with the quantity passing into the scrubbers of the direct plant. The subsequent effect of this naphthalene on the washing oil, I will leave at the present.

Let us return now and examine the main factors governing the working of a plant on the indirect and direct system of bye-product recovery. These factors can be resolved into two main channels: (1) Those which affect the working of the carbonizing plant—the ovens; and (2) those which only affect the bye-product plant.

Working of the Saturators.

Taking the first of these two channels, we revert for a moment to the main bye-product of all coking plants—sulphate. When speaking of the working of the saturators on the direct system I briefly described their construction. Now as to their actual working. Suppose we were putting on a clean or new saturator for the first time. Firstly, the bath would be made up to the desired height and strength, either with acid and another liquor or acid and water. The gas being then turned on, immediately, of course, depresses the liquor on the outside of the curtain, and raises it on the inside until the overflow has reduced the seal to a constant level, which is predetermined. The circulating injector would be started, so as to ensure a constant free movement of liquor within the saturator, and also to allow the saturated solution to deposit its salt in a suitable receptacle, draining-box, pan, or any other piece of apparatus of varying design used for this purpose.

Suitable gauges are provided to enable the attendant to ascertain the quantity of back-pressure thrown by the saturator, and an ideal method would be to keep this pressure constant. I want you now to realize that any variation in this pressure immediately affects the whole plant—ovens, remainder of the recovery plant, and exhausters. What I mean is that, supposing the back-pressure increases (assuming that the saturators are working under pressure), the amount of pull on the ovens decreases until the exhauster man increases the speed of his exhausters. If the pressure decreases, the reverse occurs, and the pull on the ovens is immediately increased.

The causes governing the alteration of back-pressure thrown by the saturators are easily found, but are certainly not as easily remedied. We find that the curtain-slots are ideal places for incrustations of salt to occur as the point of saturation of the bath is reached. Owing to the decreasing area of the slots, the velocity of the gas passing through the bath increases, and at the same time the amount of initial pressure necessary to force the gas through this restricted area must also increase. Sometimes these slots are completely blocked; and then the gas has to actually pass underneath the curtain. When this occurs, the amount of back-pressure thrown by the saturator is easily doubled. Another point where salt blockages may occur is in the baffle which is necessary to keep back the spray carried forward by the gas. I have even known an incrustation of salt, which I might liken to a bridge of salt, form between the curtain and the saturator lining.

You can, therefore, see that, much as it may be an ideal method to be continually ejecting salt, or, in other words, always keeping the bath at the saturation-point, it is, in my opinion, better to make-up the bath after each batch of salt is dealt with. To make myself clearer on this point, I might say that from the receptacle in which the liquor is allowed to rest for a moment the sulphate is run into a centrifugal dryer and whizzed; this process corresponding to a "fishing" on the indirect plant. This periodical "making up" of the bath tends to cleanse the curtain; though blocked baffles must be eased by spraying water into the saturator outlet. Where bridging occurs, the only remedy is to shut-off the saturator, and allow it to stew with weak liquor, which will dissolve-out the incrustation.

Looking at all these points, it can be at once seen that the maintenance of a constant pull on the ovens in the direct system is not so easily accomplished as in the indirect plant, where no amount of saturator trouble would affect the immediate working of the plant, which in the old type is absolutely an independent unit. On the other hand, it is not necessary to keep the acidity of the bath liquor any higher than 5 to 10 per cent. of free acid on the direct plant; and even with this percentage, it is quite possible to keep down the quantity of the ammonia in the gas leaving the saturator to the smallest possible limits, and should not exceed 1½ oz. of sulphate of ammonia per ton of coal carbonized.

Still, this constantly altering back-pressure does not tend to regular working; and we have in this instance an important illustration of one of the main differences between direct and indirect recovery. If it does happen (as is not at all likely) that the plant is not provided with a stand-by saturator, when serious blockages do occur, recourse must be had to the bye-pass, which instantly relieves the pressure, but is also a source of considerable loss of ammonia. Most plants are provided with stand-by saturators; and these should be kept in instant readiness to be put into action at a moment's notice. This can be done by simply opening two valves—the inlet and outlet.

While on this point, it would be well to emphasize the necessity of providing first-class valves in the saturator-house. These valves have to work with high temperature gas; and it is most important that they should remain perfectly gas-tight at high as well as at low temperatures. Nothing can be worse than leaky valves, for reasons which it is easy to understand. The valves should be so constructed as to be easily operated by one man, and should be kept in thorough working order, so that there should be no necessity for the use of bars as levers to either open or effectively close them. When a saturator is laid-off for examination or other reason, it is important that no gas is escaping into it; and this can only be ensured by the use of absolutely reliable valves.

Another point which I should like to emphasize is the provision of a suitable receptacle below the floor-level of the saturator-house; so that any mother liquor or acid which may be spilt (and even in the best regulated sulphate-houses periodical spilling does occur) can immediately run into this tank or receptacle. It is also useful to receive the swilling from the cleaning-up, which is always good for plants of this description. The adoption of this idea would be to save many pounds which would otherwise be lost.

The Use of Tar or Liquor.

The second point of factors affecting the working of the carbonizing process in a direct plant is that in connection with the tar produced. This point is only applicable to the direct process, and does not enter into the semi-direct process. It is the usual practice on all coking plant to maintain a constant circulation in the hydraulic and the foul mains. Some managers favour the circulation of liquor; others the circulation of tar. I think, however, that the majority favour the use of tar; and I must say that I belong to the latter. In any case local circumstances must govern the use of either tar or liquor. Let us assume, then, that in our case we are circulating tar through our mains. In the indirect plant this tar would be picked-up by the pump from the deposit tank, into which is run all that deposits between the ovens and the ammonia scrubbers. The composition of this tar is quite normal, and is fluid at ordinary temperatures. The result of this circulation is to sweep out of the mains any substance of a pitchy nature which may deposit there, and cause trouble if it were not removed.

Any deposit that is swept down is caught in suitable cleaning pockets, which can be fished-out from time to time.

Very different, however, is the tar which the pump picks up from the deposit tank on the direct plant. This tar is semi-solid at ordinary temperatures; the reason being, as I have previously stated, that, owing to the high temperature at which it is recovered, only the higher boiling fractions are thrown down. If this tar is circulated for any length of time it becomes thicker still, and rapidly loses its power of sweeping-out any pitch deposits. In addition, it is highly contaminated with ammonium chloride, and if allowed to cool will present small grains of chloride on the surface. Suppose, now, that the circulating pump was to stop for a short time, due to the necessity of repairs, or packing, &c., or to steam pressure being reduced, this tar, which is fluid as long as it remains hot, rapidly sets in the delivery pipes, and when the pump is started again there is trouble. Of course, the tar thrown down in the condensers should really be allowed to run into this deposit tank; but one can easily see that this would be defeating the fractional condensation, which is so much spoken of at the present time. I have found it necessary to allow part of the naphthelenated oil from the condensers to run into the deposit tank—*i.e.*, the oil which has been allowed to cool and deposit naphthalene. This tends to keep the circulating tar thin, and more easily controlled. Let me here emphasize the necessity for ample provision being made in the size of the tar-cleaning pocket. This cannot be too large, and should be so arranged that it can be easily cleaned out, and, at the same time, of such a design that none of the deposit be allowed to be carried into the deposit tank with the tar.

Turning, again, to the quality of the tar from the direct plant, we find that it contains large quantities of ammonium chloride; the reason being that the liquor from the tar-sprays or tar-extractors is run into the deposit tank, where it intimately mixes with the tar, besides the very complete intermixture which takes place in the tar-extractors themselves. In the indirect plant the tar contains only a normal proportion of chlorides, while (unless treated) that from the direct plant contains as much as 20 lbs. of ammonium chloride per ton. This is a very serious item for two reasons—for the considerable loss in ammonia and for the great amount of damage that it will cause in stills used for its distillation. I have seen the condenser of a tar plant when distilling direct-recovery tar completely blocked with ammonium chloride. The only way to combat this difficulty, and at the same time make as small a quantity of liquor as possible, is to wash the tar with steam, and, after washing, allow the tar to settle. By this means the quantity of chloride can be reduced, but not to so small a quantity as I should like to see. This difficulty with tar is present in the semi-direct process, but not to such a large extent; and in the indirect process the trouble does not arise at all.

The third factor affecting the working of the carbonizing process is more or less present in all systems, but is certainly accentuated in the direct system. I refer to blocked coolers or condensers. The naphthalene which is thrown down in this part of the plant is, as I have shown before, considerable, and gives rise to increasing back-pressures, which affect the ovens in the same way as blocked saturators. In order for a complete separation of naphthalene to be effected, I can only conceive of one method—that is, to throw down this substance, as already described, and to then finally wash the gas with creosote oil in such a manner that the whole of the remaining naphthalene is removed. Of course, the danger is that, when washing the cold gas with creosote oil, benzol is also removed; and arrangements would have to be made that the oil used in the final washer would have to contain a minimum of naphthalene.

Insufficient attention has been paid to the naphthalene trouble on direct plants. It should be put on a scientific and satisfactory basis. Nothing can be more disconcerting than to continually find the mains leading from the benzol scrubbers blocked with naphthalene; for, in spite of the fact that irregular working is set up, the monetary loss of the value of the naphthalene is considerable. This arises from the fact that the blocked mains must be steamed-out to relieve the pressure; and usually no provision is ever made for this, so that the naphthalene can be recovered in a marketable form. In addition to this, any main which requires steaming-out must be "dead"—viz., must not be passing gas—otherwise the results are poor. In order to accomplish this steaming, the portion of main must be isolated—a most difficult thing to do, very often involving shutting-down part of the plant.

Coming to the second of our main factors—those which only affect the bye-product plant—we are able to bring a closer differentiation between the advantages and disadvantages of both processes. In the indirect plant we have the handling of large volumes of ammoniacal liquor; and in this handling certain specific losses take place—losses in ammonia. Then we have the distillation of this liquor, which in a fifty-oven plant must be at least 100 tons per twenty-four hours, and the consumption of steam something like 8 tons per ton of sulphate produced. In addition, there is the use of lime in the distillation. The semi-direct process has recourse to distillation of the liquor from the condensers, and exactly the same amount of lime must be used as in the case of the indirect plant. The amount of liquor dealt with in this type of process is about half of the volume obtained in the indirect plant. Where the disposal of effluent from the stills is a problem—and it is more or less acute at all works distilling ammoniacal liquor—this factor is a great set-back to the semi-direct process. Then we have the troubles occasioned by blocked stills, which have to be pretty frequently cleaned out. In addition, the wear and tear on an indirect sulphate plant, particularly the saturators, is very much higher than in the direct, on account of the higher temperatures at which they are worked. There are also troubles with blocked condensers and blocked ammonia scrubbers, which also seriously affect the efficiency of an indirect plant.

One of the main claims of the direct process is that there is no noxious effluent; and this has been one of the chief reasons which has prompted coke-oven people to instal the direct recovery system. The claim is not altogether accurate, although the effluent is only equivalent in volume to the amount of moisture contained in the coal charged into the ovens. I refer to the effluent thrown down by the condensers in the hot process. This effluent, however, is very useful when cooled for use as cooling water in condensers, oil coolers, &c., as, owing to its containing practically no dissolved solids, there is no incrustation as a result of its use. One way of utilizing it is to allow it to trickle over pipes already incrusted with water deposit, both organic and inorganic. The results obtained are certainly surprising, as in the course of time, ranging from a week to a month according to the thickness of incrustation, the whole of the solid matter disappears and leaves the pipes quite clean, and materially enhances the efficiency of the coolers. Another way is to use it in the quenching of the coke. By this means the greater part of it can be disposed of.

Comparison of the Two Systems.

We are now arrived at a point where we can conveniently compare the merits of the two systems. Taking, first, the indirect plant, and using as a basis a sixty-oven battery. The coolers and scrubbers are probably looked after by one man per shift; the exhausters and pumps also require one man per shift; the sulphate still requires two men (or a man and lad); and the benzol plant one man per shift.

Chief Troubles.—Blocked condensers, scrubbers, stills, losses due to handling ammonia liquor in spent liquor and in washed gases; use of large quantities of steam for the distillation of liquor; also trouble in disposing of effluent liquor.

Advantages.—Sulphate plant absolutely an independent unit, and if the supply of acid runs short, or the sulphate plant has to be shut-down, ammonia liquor can be stored for use till all goes well again.

The Semi-Direct Plant.

Chief Troubles and Disadvantages.—The production of an undesirable effluent, the use of steam and lime for the distillation of liquor and losses entailed; the main leakages of ammonia in this type being in the gas leaving the saturators and the spent liquor from the stills. The use of condensers first to cool-down the oven gases and then the saturator gases, thereby duplicating plant. Sulphate plant not an independent unit; blocked saturators causing trouble on carbonizing plant. In case of temporary stoppage of acid supply, the whole of the ammonia is lost—no storage of liquor can take place. A sixty-oven plant of this type would require the same number of men to work it as the previous example.

Advantages.—

(1) The elimination of the naphthalene difficulty.
(2) The production of a tar tolerably free of ammonia.
(3) The fact that the exhausters can work with cold gas.

The Direct Plant.

Chief Troubles and Disadvantages.—

(1) Blocked saturators, condensers, and mains, and thereby irregular working of ovens.
(2) Tar produced contains relatively large quantities of ammonia, entailing considerable losses if not treated, besides having deleterious effects on tar-stills. Losses due to ammonia occurring as well in gases leaving saturator and effluent.
(3) More power required for exhausting plant, on account of having to deal with a larger volume of gas occasioned by a high temperature.
(4) Power required for tar extraction. Sulphate plant not an independent unit and similarly placed to previous example.

Advantages.—

(1) The number of men required on a similar plant to those already quoted will be at least one less per shift.
(2) No steam or lime required to distil condensed liquor.
(3) Effluent obtained easily handled to conform to Rivers Board authorities.
(4) No handling of ammoniacal liquor with its attendant losses.
(5) The production of a bye-product more valuable than sulphate.

Viewing this comparison, it may be hard to find how any one system can claim advantage over another. They each have their own advantages; they each have their disadvantages. I am inclined to think more and more that the type of system which is installed must be governed entirely by the character of the coal which is to be dealt with. This is the point which I emphasized at the outset, and to which I again draw attention. It is all very well for us to be told that naphthalene is the result of bad working, or that pitchy mains are due to a similar cause. These explanations are given without a complete examination of local circumstances; and conclusions are very often hastily arrived at, without due regard to the character of the coal that is being dealt with.

The Question of Chloride.

Turning for a moment to the question of chloride—a question in which I am particularly interested—what do we find is the extent of our knowledge on the subject? There have been articles in the Technical Press lately on the corrosion of refractory materials; but I am not yet satisfied with any explanations I have seen as to the causes governing the destruction of oven-linings and the parallel formation of ammonium chloride. There must be certain laws governing the formation of this salt during the destructive distillation of coal; and these laws are waiting to be discovered. The ordinary coke-oven manager is far too busy a man to successfully evolve a problem of this kind; and I here make an appeal to the University authorities to conduct some research on this most important subject. We have heard very little of this salt in the past from our *confrères* in the gas industry; but I was talking a little time ago to the head of one of the large gas concerns in the North, who told me that they had no idea of the extent to which ammonium chloride was formed. The installation of vertical retorts had revealed the fact to them; and he was particularly interested to see the salt actually being produced in marketable form on a coke-oven plant. As another illustration showing the comparative ignorance on the subject, I might say that two well-known coke-oven construction firms were prepared to tell my firm that the quantity of chlorides in our coal was so small as to make no matter, when we were then actually making for sale 2 tons of ammonium chloride per week. This figure, I might say, has been multiplied five times since then; and I shall be only too grateful to give any

assistance in the way of information to people conducting research into the causes governing its formation.

EFFICIENT WORKING OF DIRECT RECOVERY PLANT.

Dealing with the question of the points necessary for the efficient working of a direct-recovery plant, I will, in conclusion, enumerate several which I think will tend to be helpful in the guidance of those who will have under their care or notice the arranging of such plant. The sulphate plant should be as near to the ovens as it is possible to arrange, so as to avoid long lengths of mains, and, as I have mentioned before, the tar cleaning pockets should be made of ample proportions. The exhausters should be steam-driven, either of the rotary Beale type or else turbo exhausters. I emphasize the point of steam-driven exhausters, because I think that they tend to more flexible working, and are less liable to stoppages due to failure of current—a fact which is very important on large coking installations. Even in the best regulated power-houses something occasionally goes wrong, and my experience of electricians is that, although they may be excellent men at their professions, they are not always able to secure continuous running. Special attention should be paid to the draining of the plant, and wherever oil-tanks or tar-tanks or liquor-tanks are fixed they should be surrounded with suitable trenches, lined with blue bricks, leading into a common tank. This is also applicable round the benzol scrubbers, where, if leakages of oil do occur, no apprehension need be felt as to any loss arising. Seal-pots should be of ample capacity so as to allow of easy cleaning with ladles, and should be so arranged that, if they blow, the oil or tar or liquid which they contain should be led away to the common tank. Where pumps are installed, direct-acting steam pumps or electrically driven turbine pumps should be stipulated. They should be erected on beds fitted with drains, so that, in the event of examination of the valves, or packing, all leakages are taken away to the common tank.

While speaking of pumps, I might say that only first-class steam-valves should be used; inferior valves being absolutely useless, and are more costly in the long run. [Good valves of the Hopkinson or Dewrance type are well worth the extra money, and can be relied on to shut off steam when they are closed.] Another point in this connection is to insist on first-class piping being used for pump suctions and deliveries; also that great care is taken to ensure that all joints are perfectly tight, and not simply screwed-up and then caulked if they leak. Where long deliveries are necessary, the pipes should be securely clamped, so that no vibration can cause the joints to become slack and leak. It is a mistake to use common piping on a direct-recovery plant, because the presence of ammonium chloride is not at all conducive to long life. Where pipes are laid in the ground, suitable trenches, made of brickwork and covered with plates, should be provided. Nothing is worse than to find joints leaking underground. and having to disturb paving, &c., and not being quite sure where the pipe is. Ample use of flanges should be insisted on, so that, when piping has to be renewed, it can be done with a minimum of labour and cost. A great fault is to erect a plant with the idea that it should never come to pieces. Sometimes the greatest difficulty is met with in renewals. Steam supply pipes should be properly covered with non-conducting material, and steam should be laid on to all points requiring the removal of naphthalene. All the mains should have machined faced flanges to ensure a tight joint being made, and expansion joints should be inserted where necessary.

Once more I return to the question of good gas-valves; and these should be insisted on. Valves must be relied on to close tight without any undue forcing; and I have found that a suitable type is the Bryan Donkin design. It is important that the whole of the valves on the plant are periodically tried, so as to ensure their being in thorough working order. Lead acid valves and mother liquor injectors installed in the sulphate-house should be of an approved type, and should be of such a design that they will have a maximum life. The saturators should be so designed as to allow of easy inspection. Manhole lids should be provided wherever possible, so that the examination of the saturator can be made periodically with comparative ease.

FIRE PREVENTION IN FACTORIES, &c.

A special list of precautions to be taken against fire has been prepared by the British Fire Prevention Committee for use in factories, works, &c., which are experiencing war emergency pressure and are engaged on night work. In many respects, however, the rules would be equally applicable to places where other conditions prevailed. The portions of the "Warning" relating to lighting and heating are as follows:—

Lighting.—All systems of lighting, whatever they may be, should be frequently overhauled. All gas-burners should be protected by globes. Pendant gas-lights require ceiling shields. Swinging gas-brackets should not be used. On no account should any paper or textile shade or cover touch, or be nearer than 2 inches to, any electric lamp bulb.

Lighting-Up.—One person should be deputed to attend to lighting-up for each department or floor. For gas lighting (failing an electric lighter), a taper should be used. If oil-lamps are used, these should be trimmed and filled in a special lamp-room (preferably in a detached building), by one responsible employee only.

Heating.—Any system of artificial heating in the factory should be overhauled before use. No combustible material of any description should be allowed in proximity to either the heating apparatus or any pipes in connection with it. Guards should be provided for all open fires.

The lighting, heating, exit, and fire service arrangements of each department or floor should be inspected at least once a month by a responsible officer of the management. Should the least thing appear to be out of order, those in charge should at once give notice to the management and fire staff. On the slightest sign of heat or smell from a flexible electric wire, the wire in question should be unplugged or switched off.

WAR AND CO-PARTNERSHIP.

A New Year's Greeting to South Metropolitan Co-Partners.

The current issue of the "Co-Partnership Journal" of the South Metropolitan Gas Company opens with the following address to the employees by Mr. Charles Carpenter, D.Sc.

Whatever statesmen and politicians may have thought, it is hardly likely that any of our co-partners could have imagined last New Year's Day that the nation was so soon to be involved in a struggle for its freedom and its liberty. As co-partners, our main concern was the extension and promotion of the system which has flourished among us so long, and enabled us to strengthen the basis upon which our business rests, and to carry it on with a singleness of purpose unhampered by industrial strife and discontent. With the result, we were all of us content. Our principles have been increasingly adopted by many who have looked to us for guidance; and as an organization for supplying a public necessity its efficiency has certainly improved. Our managers have realized the growing importance of science to guide their operations, technically as well as commercially, and our workmen appreciate more strongly the value of education even in the ordinary routine of their daily life.

Only by storm, however, can the real stability of human building be discovered; and it has been left for the fierce tempest of strife which now rages over Europe to be the means of showing us the true strength of co-partnership. Prosperity is often a greater test of character than adversity. How will the prosperity we have enjoyed during a quarter-of-a-century of co-partnership stand the trial? Fortunately, we are in a position to give a satisfactory answer to this question. If co-partnership had brought with it the bane which so frequently accompanies success—selfishness—it would have deserved the reproach sometimes made that those who practise it are little communities living only for themselves. But how have our co-partners responded to their country's call? Twenty-two per cent. of the employees have given up congenial and regular employment to fight with the navy or army for the freedom of their beloved land; while the remainder are voluntarily taxing themselves to maintain in comfort as far as possible the dependants of those away at the front. Can the Fabian Society—the preachers of a socialism which is not ashamed to spread untruths concerning our co-partnership, but has not the courage to correct them—can their members point to such a record? It has been left for co-partnership to set an example of which we may well be proud, proving as it does that the fellowship in which we have worked together for more than a quarter-of-a-century has been a means of training its participators to a better appreciation of the duties every citizen owes to the State.

I believe the nation is, as yet, only at the beginning of her tremendous struggle; and although I am certainly not downhearted, I cannot think of Christmas as "merry," or the new year as "happy," when I remember how our brave fellows are daily facing death in our warships or our battle trenches. But I do hope that the binding together of all classes, high and low, rich and poor, in one great co-partnership will long outlast this Christmas and the New Year!

THE BRITISH DYE INDUSTRY.

Scheme for the Formation of a National Company.

The dye and allied trades have received a circular from the Board of Trade Committee on Aniline Dyes detailing the steps taken in regard to the formation of a British Company.

It is stated that at a meeting of representatives of large firms and associations making use of artificial dyes, held on the 10th ult., the following resolution was unanimously passed: "That this meeting approves in principle of a national effort being made by the trade to increase the British supply of synthetic colours, and welcomes the assistance of his Majesty's Government for the purpose; and that a Committee be appointed, as representing the trades concerned, with authority to confer with the representatives of the Board of Trade with a view to the elaboration of a scheme." As is already known, the result of the labours of this Committee was that the Government announced their willingness to assist in the establishment of a Company to supply the needs of home industries for dyes. The lines to be followed are—

> A limited Company to be formed under the Companies Acts, with a share capital of £3,000,000, divided into 3,000,000 shares of £1 each. This capital to be subscribed by those interested and to be paid up as to 2s. 6d. a share on allotment and 5s. on June 30, 1915. The remaining 12s. 6d. is not likely to be needed for some time to come, and when required will only be payable in calls not exceeding 2s. 6d. a share at intervals of not less than six months between each call.
>
> The Government to advance to such Company £1,500,000, bearing interest at the rate of 4 per cent. per annum, and secured as a first charge on the assets and undertaking of the Company, and be repayable in 25 years.
>
> The interest on the advance and a sinking fund for its repayment are to be payable only out of the net profits of the Company, but are to be cumulative.
>
> The Government advance to be made, as to £750,000 on the Government being satisfied that the £3,000,000 capital of the Company has been fully subscribed, and the remaining £750,000 as soon as the call of 5s. a share has been made.
>
> The Government shall have the right of appointing two Directors of the Company with power to veto any undue encroachment on the business of British manufacturers of products other than dyes and colours or the giving of any undue preference as regards

supply, prices, or otherwise to consumers of the Company's products. The names of the gentlemen so appointed are Sir Gilbert H. Claughton, Bart. (Chairman of the London and North-Western Railway Company), and Sir Frank Forbes Adam, C.I.E.

The Company shall remain British.

The Committee consider that the condition of co-operation would be best secured by the subscription of the Company's share capital by those interested, and also by a contract being entered into between the Company and the consumers or users of its products whereby the consumers should agree, for a period of five years after peace is established, or five years after the expiry of existing contracts and of all deliveries thereunder (whichever is the longer period), to take their supplies from the Company in all cases where the Company are able to supply the same of good quality and at reasonable prices. But with a provision that, if a consumer should consider the prices fixed by the Directors of the Company too high, he may require that the prices to be charged shall be determined by an independent referee.

To meet the difficulties of the present situation, it is proposed to take over certain existing colour works and use the plants to their full capacity for the manufacture of such dyes as are essential. Negotiations with Read Holliday and Sons, Limited, have resulted in arrangements being made for the extension of their plant so as to secure a material increase in their output; and it is proposed that the new Company shall take over the business and undertaking of Read Holliday and Sons, under an option which has been obtained. It is intended to negotiate for the acquisition of other businesses which it may be desirable to take over and extend in the same way as that of Read Holliday and Sons, and also to take steps to acquire a suitable site and erect and equip works thereon. This effort to create a great national industry does not preclude arrangements being made on co-operative lines with existing concerns in Switzerland; and the Committee have grounds for hoping that such arrangements will be possible.

In order to ascertain the extent to which they can rely on the support of those interested, the Committee have issued a form, to be filled up, with the object of finding out the amount of share capital in the Company which the signatory of the form will be willing to subscribe. If the response to this communication justifies it, the Company will be at once incorporated and a prospectus issued inviting the formal subscription of the share capital.

NORTH CAMP AND FARNBOROUGH ELECTRIC SUPPLY.

The works in connection with the North Camp and Farnborough Electricity Department of the Aldershot Gas, Water, and District Lighting Company have now been completed, and were put into operation last Saturday week. The supply was turned on by Mrs. R. W. Edwards, the wife of the General Manager and Secretary of the Company. The system is high-tension, single phase, alternating current, fifty periods, and designed to meet the demands of a large number of the Company's outlying districts.

In addition to this station, another station has been erected at the Company's Ash Road works, not only to meet the requirements within these works, for stoking machinery, coal-breaking, and conveying, as well as for the telpher, but also for supplying districts adjoining the township of Aldershot. This latter station is direct current.

At both the North Camp station and Ash Road the electricity is generated by Browett-Lindley high-speed, multi-cylinder engines; and the Company's gas is the motive power.

AT THE AUCTION MART DURING 1914.

Messrs. A. & W. Richards' Report.

Reporting as to the trend of the prices of gas stocks and shares sold by auction by them during the year, Messrs. A. & W. Richards say:

During the first half of this year, we issued an exceptionally large amount of new capital for gas companies; and throughout the whole period, a very good demand was experienced at fair prices—the ordinary stocks of leading London-Suburban companies selling to yield about 5¼ per cent., and of undertakings operating a little further away from town and in the provinces, from 5⅜ to 5¾ per cent.

So far as debenture and preference stocks were concerned, there was only a demand for limited amounts; and as we have reported on previous occasions, excellent though these two classes of securities undoubtedly are, they do not seem to find as much favour with investors as do the ordinary stocks. Good London-Suburban debentures generally sold to return 4½ per cent. or a little under, and preferences about 5 per cent.

Since the outbreak of the war, the question of raising new capital has naturally assumed a different aspect. In some quarters, directors have decided to leave the matter in abeyance for a time; in others, new capital has been offered, and, where this has been done, the result has, we think, been very gratifying, having regard to the difficult times through which we are passing. During the autumn, we have sold a large amount of stock—principally ordinary; and although, as was to be expected, there has not been the same strength in the demand as in normal times, yet good London-Suburban stocks have been absorbed on a 5½ per cent. yield, and investors who have had liquid resources, have not hesitated to put further money into the gas industry.

The remarks which we have already made as to debenture stocks during the earlier part of the year are equally applicable to the later period; and although good stocks have been available at what would appear to be attractive prices, buyers have exhibited a disinclination to take them up in any substantial amounts

[This report is referred to in our "Retrospect of the Year."]

Manchester's Record Gas Consumption.—Dark days during last week gave a considerable impetus to the demand for gas in Manchester. At a meeting of the Gas Committee, it was stated that the amount of gas consumed in the city on Tuesday exceeded all previous records, having been no less than 29,690,000 cubic feet.

REVISED WATER CHARGES IN BIRMINGHAM.

"Trade" Objections.

Last Tuesday, Mr. R. C. MAXWELL conducted an inquiry, on behalf of the Local Government Board, with reference to an application made to them by the Birmingham Corporation for an Order fixing the new scale of charges for water supplied for domestic purposes which it is proposed to bring into operation on the 1st of April next.

The TOWN CLERK (Mr. E. V. Hiley), in opening the case for the Corporation, said the sole question for consideration was whether or not the suggested new scale of charges was reasonable and just. The scale now in operation was based on the annual rent, which had been interpreted to mean the net annual value. The steps in the scale, however, were unequal, and inflicted hardship on some of the occupiers. Where the net annual rental, for instance, was £10, the water charge was 10s. 4d.; but if the annual rent was £10 0s. 1d., the water charge at once jumped to 16s. 9d. The guiding principle of the new scale was that a flat-rate was proposed for water for domestic purposes, based on the rateable value of the premises occupied. This was a new departure in Birmingham. To arrive at the net annual rent for water charges had often caused a good deal of difficulty; but, under the proposed scheme, if rateable value were adopted, there would be only one method of assessing for the various dues to be paid by the ratepayers, whether in the form of poor-rate or of water charges. Much inconvenience would be avoided by this means, and a great deal of clerical work would be saved. As to lock-up shops, it was proposed to make a concession of 10 per cent. from the flat-rate. In reference to hotels and public-houses, the question of charges for water in the latter had been considered in the Court of Appeal, who had held that in such cases the domestic rate should apply. In the revised scale it was proposed that, in the main, the domestic rate should apply to public-houses and restaurants; but the Water Committee recognized that in some of the large inns and hotels in the city the rateable value was very considerable, and owed a great deal of its magnitude to the fact that something had been put in as representing the value of the licence. But, in order to meet cases of hardship, the consumer, where the rateable value was over £80, would have the option of asking to have his water supplied by meter. This was a very substantial concession. The Town Clerk emphasized the necessity of introducing a revised scale of charges; pointing out that last year's accounts showed that the revenue of the water undertaking was not sufficient to meet the expenditure in respect of sinking fund, interest, and rates, and a very substantial subsidy had to be obtained from the general rates. Last year upwards of £80,000 was required to put the Water Department straight. The Corporation considered that this was too great a charge to make on the ratepayers, and that some of it ought to be shifted on to the shoulders of the water consumer. The proposed scale would transfer about £45,000 to the consumers; and this was equivalent, in round figures, to a rate of 3d. in the pound.

Mr. *C. T. Appleby*, the Chairman of the Finance Committee of the Corporation, having given evidence in support of the revision,

Mr. H. T. EDGE (representing property-owners interested in lock-up shops and offices) directed a number of questions to the witness with the view of showing that in specific cases the new scale would involve an unreasonable increase in the water charges; and he suggested that there should be one rate only of 5 per cent. up to £120, another flat-rate of 4 per cent. from this figure up to £4000, and that beyond this amount the suggested scale should apply.

The TOWN CLERK said the Corporation were prepared to make a scale in regard to lock-up shops of 5 per cent. on rateable value up to £120, and 4½ per cent. between £120 and £2000; above this amount the scale as in the scheme would apply.

Eventually it was agreed to leave this question to the Inspector.

Mr. JOY (who, with Mr. Willes, appeared for a number of brewery firms jointly interested in 1883 licensed houses) said he did not think it could be seriously disputed that the reason for the growing scale was based on the idea that as a house increased in rateable value so there must be more use made by the house of its right to call upon the Corporation to supply water. This theory was all very well in dealing with normal cases. But in recent years two outstanding developments in connection with licensed property had been, first, that the rateable value had assumed enormous figures compared with the rateable value of unlicensed property adjoining; and, secondly, that the licensed trade had been subjected to enormous increases in legislative charges in carrying on their business. It was also clear that in the past licensees had been called upon to pay charges which the Courts had held they ought never to have paid. As regarded the extent to which water was used on licensed premises, Mr. Joy quoted the case of fifteen houses belonging to one brewery firm, and said they had been made to pay for 130,000 gallons of water they never used. If they were charged on the Corporation rate for what they actually used, instead of paying £175 13s. 9d., as under the present rate, they would be called upon to pay only £98 11s. 9d.; and if the proposition of the Corporation were carried out, the result would be that in future these houses would have to pay £262 16s. 4d., or nearly treble the value of the water they actually used. In another case, a group of sixteen houses having water-meters used 800,000 gallons less than the minimum for which they had to pay. In closing his case, Mr. Joy suggested the following maximum scale of charges to apply to off-licences: Up to £50 of rateable value, 7½ per cent.; above £50 and up to £85, 5 per cent. For on-licensed premises, the maximum scale should be 7½ per cent. on rateable values between £50 and £80, and 5 per cent. on rateable values above £80.

The TOWN CLERK, in reply, intimated that he could not accept Mr. Joy's suggestions. If the Inspector desired, he would go the length of placing off-licences among "dwelling-houses with retail shops attached;" but he preferred to keep to the scheme as it stood. The licensed trade had enjoyed exceptional advantages in the past in regard to water charges; and now that the House of Lords had decided that water used in public-houses should be paid for at domestic rates, he did not think they ought to grumble.

The inquiry then closed.

THE MIDLAND COAL TRADE IN 1914.

In a review of the Midland coal trade for the year, the most striking feature is the effect of the war on every section. Shipments of steam and gas coals from the Humber ports were stopped by the Government for about a fortnight early in August, and at many pits working had to be reduced very considerably. When shipments were resumed, they were, of course, only allowed to neutral countries; and with the increased risks to navigation, together with the high freights in operation owing to the scarcity of boats offering, shipments were on a comparatively small scale at the Humber ports, although more active business was done with the Mersey ports.

The most serious labour trouble experienced during the year was the three weeks county strike in Yorkshire, which commenced March 31, and which, incidentally, had a considerable effect on strengthening the forward market. This was brought about by the heavy buying of all qualities of coal by users in Yorkshire; and as at the commencement of the strike there were large stocks at pits in Derbyshire, Notts, Staffs, and Warwickshire, which were disposed of in Yorkshire and Northern markets supplies by that county, values were firmly held to the end of April. Consequently the colliery position was a firmer one in regard to contract renewals than would have been the case had there been no county strike in Yorkshire. which, it should be explained, was owing to differences on the minimum wage question.

Contracts with inland works for their requirements of gas coal are mostly arranged for twelve months from July 1. Negotiations for renewal were commenced early in June; and there was a very strong attempt by collieries to hold-out for the same prices as for the expiring contracts. "With the heavy fall in prices of coke and sulphate of ammonia that had taken place during the period of the 1912-13 contracts, gas undertakings very naturally expected to be able to obtain their raw material at lower prices, and, by adopting a waiting policy, it was not long before a weakness was manifest in the sellers position. Collieries began by offering reductions of 6d. per ton—indeed, in some cases renewals were made on these terms. The market became steadily weaker, owing to the lifeless position of the house-coal trade; and eventually collieries were willing to renew on reductions of 9d. and 1s. per ton, which were the general terms of renewal, although in some few instances, where the basis price was a comparatively high one, even larger reductions were obtained.

With the constantly increasing productions of gas coke, and no proportionate increase in sales, the market has become a steadily weaker one, with prices persistently on the down-grade; and at many works accumulations of stocks have been a constant source of trouble.

MANUFACTURING FUELS.

The market for steam coal and slacks has been more irregular than usual. Shipments were very much reduced after the outbreak of war, and until the end of November the market was very weak. Generally speaking prices are 6d. per ton lower than at the commencement of the year.

GAS COMPANIES ON THE STOCK EXCHANGE.

Perseverance has met with its most frequent reward, and the goal has been reached. That is to say that, as the result of all the protracted and laborious negotiations, the Stock Exchange will officially be open next Monday. This is a welcome advance; but, as an inevitable and absolutely necessary accompaniment, business will be hedged round and harnessed with a number of limitations. Considerable antagonism to these fetters is manifested in some quarters; but the vastly preponderating weight of the sound sense of the community recognizes that national interests positively demand the safeguard. The text of the official notification is too lengthy to quote, but, briefly summarized, it provides *inter alia* for: (1) Admission of only British-born and duly naturalized persons; (2) the maintenance of minimum prices; (3) cash bargains only, and no continuations; (4) particular identification of the seller and of the scrip sold; (5) no arbitrage business; (6) provisions against sales by "enemies." These conditions cannot be regarded as unreasonable or too prudential measures for the time being; and the controlling authorities may be trusted hereafter to make such modifications or relaxations as may appear warrantable. There was not much business doing in Christmas week, and, apart from other considerations, the weather was bad enough to exercise a repressive influence. Movements in price were variable. In the Money Market, the same conditions continued.

Bank rate (fixed Aug. 8) 5 per cent.; last year, 5 per cent.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 28.

Owing to the Christmas holidays, there is no change to report in the tar products market.

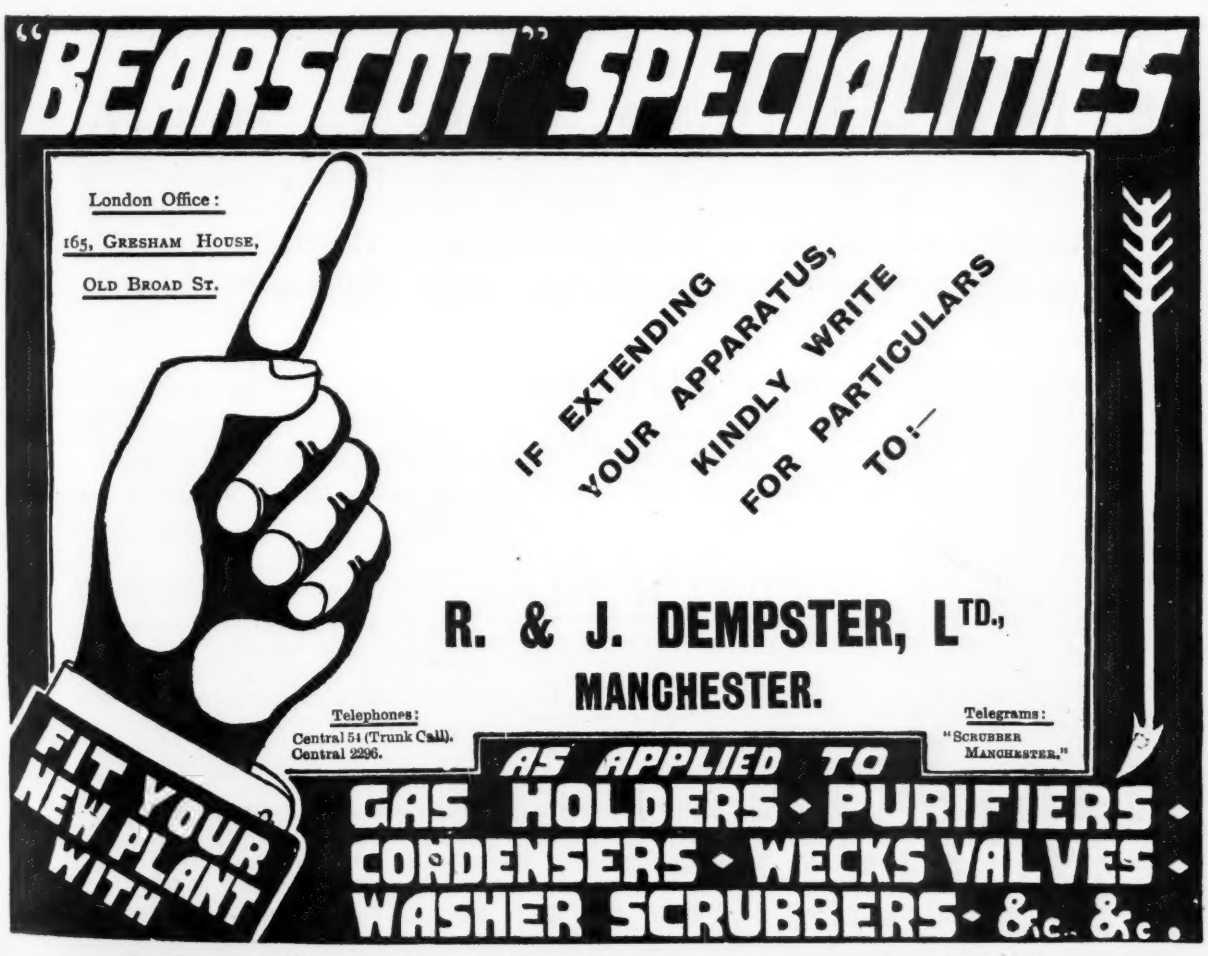
In the case of sulphate of ammonia, the advance in prices continues, and over £12 per ton, net cash, naked at makers' works, has been paid for 25 per cent. quality for January-February delivery.

Tar Products in the Provinces.

Dec. 28.

There is little alteration in the market for tar products. Pitch remains very quiet, and sales are reported at lower figures. There is no change in benzol; but there are one or two small inquiries for the forward position. There has been no business doing in toluol. Solvent naphtha has improved slightly, and sales are reported at better prices. Creosote keeps firm, and the demand is fairly good. There has been more crude carbolic offering for delivery over the whole of next year.

The average values during the week were: Value of liquid products in one ton of tar, 16s. 9d. to 18s. 3d. Benzol 90 per cent., naked,



North, 8½d. to 9d.; 50-90 per cent., naked, North, 1s. 3d. Toluol, naked, North, 2s. 3d. to 2s. 4d. Crude naphtha, in bulk, North, 5¼d. to 5⅜d. Solvent naphtha, naked, North, 10d. to 10½d. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3⅜d. to 3 7/16d. Heavy oils, in bulk, 4d. to 4½d. Carbolic acid, casks included, 60 per cent., East and West coasts, 2s. 11d. to 3s. Naphthalene, £4 10s. to £10; salts, 65s., bags included. Anthracene, "A" quality, 2d. per unit; "B," nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Dec.* 24.

In spite of the approach of the holidays there has been no slackening in the demand for this article, and a further advance in prices has taken place at all points. The nearest values are now £12 per ton f.o.b. Hull, £12 2s. 6d. per ton f.o.b. Liverpool, and £12 5s. per ton f.o.b. Leith. In the forward position higher figures have also been paid, and it has lately transpired that up to £12 5s. per ton has been realized by makers for January-June delivery, f.o.b. Liverpool as well as Leith.

Nitrate of Soda.

The tone of this market is firm, and quotations are well maintained at 10s. per cwt. for ordinary quality, and 10s. 6d. for refined, on spot.

Sulphate of Ammonia.

The market for this article remains firm for both prompt and forward delivery, and some sales are reported at better prices. Outside London, makes are quoted at £11 2s. 6d.; Hull, £11 12s. 6d.; Leith, £11 15s.; Liverpool, £11 12s. 6d. to £11 15s.; Middlesbrough, £11 15s.

COAL TRADE REPORT.

Northern Coal Trade.

The holidays have added to the interruptions that the coal trade has known of late; but they have reduced the stocks that are held, so that when shipments are resumed there should be brisk work. In the steam coal trade, the lack of tonnage is felt, though there are many loaded vessels ready to leave the ports, and arrivals of vessels over the week-end may allow the pits to work. Best Northumbrian steam coals are about 13s. per ton f.o.b.; second-class steams are quoted at 10s. 6d. to 11s. per ton; and steam smalls are from 7s. 3d. to 8s. 9d. per ton, with some irregularity in the demand for the latter. The gas coal collieries worked fairly up to the holidays. But the resumption of work this week is not complete, and thus the output will be well taken up for a little time, as the consumption is now at its heaviest. Best Durham gas coals are 12s. 6d. per ton f.o.b.; second-class gas coals are 10s. 9d. to 11s. per ton; and "Wear Specials" are firm at 13s. per ton, with a steady inquiry generally. Little is doing in contracts, which is not to be wondered at when it is borne in mind that though the price of the coal is unaltered, the record freight makes coal exceedingly high delivered. For example, gas coal delivered at Genoa is about 33s. per ton, and other ports are similarly high, so that buyers seem inclined to deal only from "hand to mouth." Coke is generally steady. Gas coke is very plentiful, and its price varies a good deal. Gas coke may be quoted from 10s. 9d. to 12s. per ton f.o.b. on the Tyne, according to quality.

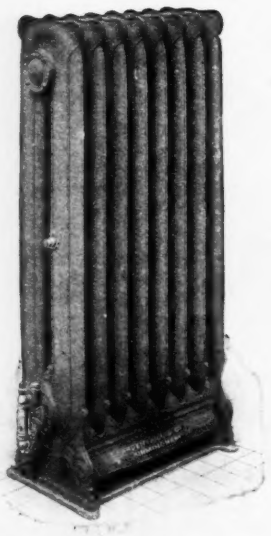
International Light and Power Company, Limited.—Presiding, on Monday of last week, at the first meeting of shareholders, the Chairman (Mr. Follett Holt) pointed out that the Company had been invested in the Venezuela Electric Light Company, the Merida Electricity Company, and the Paraná Light and Power Company. The last-named Company operate both gas and electricity works in Paraná (Argentina), and serve a population of about 42,000. The International Company, after paying the preference dividends, have a carry-forward of £3386.

Insurance of Mantles and Glassware.—The Laclede Gas Company of St. Louis (Mo.) announce a plan by which gas mantles and glassware on lights are insured against breakage. The Company venture into the insurance field on the conviction that developments in the gas industry and in the manufacture of high-grade mantles and glassware will make the insurance plan a success. For 75 c. per lamp per annum the Company will insure each light, and keep it in working order and perfect repair. In effect they agree to respond to the customer's call, no matter how many times it may be made during the year, and furnish labour and material necessary to keep the lamp in serviceable working condition.

Railway Charges for Carrying Glassware.—Complaints have been made in the Dudley Chamber of Commerce which deserve consideration, in view of the efforts being made by British glass manufacturers to supply requirements under existing conditions. At a recent meeting, the Secretary (Mr. T. H. Gough) said a glass manufacturer in the district was trying to capture German trade by the making of cheap electric bulbs and similar articles; but the railway companies were charging for the carriage of the goods the same rates as for best cut and table glass, with the result that it was almost impossible to do the trade successfully. Mr. Bloomer remarked that, instead of the railway companies helping manufacturers in the crisis, they were putting every stumbling-block in their way. The fact was the companies did not care if they had the traffic or not. The Chairman added that he could give some glaring examples of how the railway companies had actually discouraged business. The Secretary said it cost as much to send a consignment of glass from Stourbridge to London as it did from Central Germany to London. It was decided to forward a communication on the subject to the Intelligence Department of the Board of Trade.

The "MARS" Gas-Heated Steam Radiators.

Supplied extensively for Heating Drill-Halls, Hospitals, Training and Concentration Camps, and other Military Purposes.



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WHAT MAKES THEM SO DURABLE: The Radiator Loops are assembled with malleable nipples and metal-to-metal joints—making the life of Radiator uniform and absolutely lasting in character.

AUTOMATIC VALVE: Free from mechanism; simplicity itself; and infallibility as well.

MAINTENANCE: The cost of upkeep is practically *nil.*

ON HIRE WITH MANY IMPORTANT GAS UNDERTAKINGS.

ARDEN HILL & CO.,
Acme Works, Birmingham.

Gas and Electricity at Walsall.

Ample material for discussion was found by members of the Walsall Town Council, when Mr. Oswin (the Chairman of the Streets Committee) moved the following recommendation: "With regard to the lighting of the new road from Ablewell Street to Birmingham Road, your Committee have obtained quotations for lighting the same with gas and also electricity, and have accepted the offer of the Gas Committee to fix lamps, each giving 320-candle power, for the sum of £2 15s. per lamp per annum." The Chairman of the Electricity Committee (Mr. Hayward) moved, as an amendment, that the matter be referred back to the General Purposes Committee for further consideration; the grievance seemingly being that his Committee did not get more of the street lighting. Mr. Ingram said opinion was so evenly divided on the Streets Committee that it would be better for the General Purposes Committee to "act as arbitrators." Mr. Thomas said he thought there could be no two opinions that the Streets Committee acted in the proper manner in this matter. They had two quotations before them—one from the Electricity Committee for 100 to 150 candle power lamps at 54s. 6d. per lamp, and one from the Gas Committee for 320-candle power lamps for 55s. each. The candle power for electric lighting was taken on the German principle, and the gas on the English principle. There was no doubt that gas, with efficient mantles, did penetrate better than electricity. The Electricity Committee wanted a guarantee for fifteen years. Mr. Ward remarked that he was ashamed of the Electricity Committee for having quibbled over such a little thing. The Chairman of the Committee, however, got his way; for the amendment was carried by fifteen votes to eight.

New Gas and Electricity Show-Rooms at Burton.—Handsome new show-rooms for the Gas and Electricity Departments in a central position were opened recently at Burton-on-Trent. The ceremony was performed by the Mayor (Alderman J. S. Rowland), amid a representative attendance of townspeople and visitors. In some introductory remarks, Alderman T. E. Lowe (the Chairman of the Gas and Electricity Committee) congratulated Mr. H. Beck (the Architect) and Messrs. R. Kershaw and Sons (the Contractors) on the excellent result of their work. The Committee did not wish to do anything to hamper in any way the tradesmen of the town; and they believed they had arrived at a solution of this difficulty which would be for the benefit of the tradesmen, the Corporation, and the ratepayers. There is an outside installation of high-pressure gas-lamps; while the interior comprises a series of rooms excellently fitted up and arranged to show the various appliances with suitable surroundings. A feature is the use of English glassware for incandescent gas lighting, from the Tutbury Glass Works of Messrs. Webb and Corbett, Limited. The care expended on these new show-rooms should result in an increase of business for the Gas Department and their Manager (Mr. R. S. Ramsden).

Sequel to a Typhoid Epidemic at Kenilworth.—It may be remembered that trouble arose at Kenilworth in the spring in regard to the pollution of the water supply. Satisfactory explanations of the cause were given to the District Council by an official of the Local Government Board, as well as by Mr. H. Ashton Hill, M.Inst.C.E., on behalf of the Water Company. However, there has lately been an epidemic of typhoid fever in the town; and at the Warwick County Court last Friday week, Mr. Arthur Henry Spicer sued the Company for damages arising therefrom. Mr. H. Field, for the plaintiff, said that his client brought the case on behalf of his daughter as "next friend." Defendants had paid £75 into Court, and plaintiff accepted this sum. Mr. S. R. Masser, for the Company, agreed to the payment of the amount named—£40 to the father for expenses and £35 for the benefit of the daughter.

A Fatal Fire at Bromley.—An inquest was opened at Bromley last Wednesday (and then adjourned) concerning the deaths of a man and three children in a shop fire on the previous day. One of the witnesses was George Buckland (a son of the deceased man), who said that at 4 o'clock on Tuesday morning he got up and lit the gas in his bedroom and in the bathroom and kitchen. He next lit the gas at the foot of the stairs. The bracket was loose, and slipped round as he touched it. A number of paper bags were hanging near the bracket. Later, he lit, but afterwards put out, a lamp in the middle of the shop. He left the gas at the foot of the stairs burning very nearly full on, so that the family could find their way down. At 5 o'clock he went off to market with the cart. The door was not shut properly; but he closed it before he went out. While he was shutting the door, he noticed the gas was blowing about. Answering a Juryman, he said the bags were hanging above the gas-bracket.

Messrs. Sadler and Baker have recently sold 500 additional ordinary £10 shares in the Frimley and Farnborough District Water Company at from £14 10s. to £14 17s. 6d. each. The sale produced £7303 2s. 6d.; the average price per share being £14 12s. 1½d.

The British Aluminium Company, Limited, of No. 109, Queen Victoria Street, E.C., forward a copy of a new and enlarged edition of their "Aluminium Facts and Figures" in pocket-book form. There are to be found in it information and tables of all kinds useful to the increasing number of aluminium users; and it is prepared in loose-leaf form, to permit of further leaves being inserted as available.

The current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company is accompanied by the "Co-Partnership Almanac for 1915." In addition to a portrait of the late Sir George Livesey, over the words "Co-Partnership is Brotherhood in Business," there is a list of co-partnership companies, showing that five additions were made in 1914—Redhill, Eastbourne, Newmarket, Maidenhead, and Shrewsbury. So does the good work go on.

If you value your Customers' Good Opinion fix only the Original

Davis Hygienic Gas Fires

There are many imitations, but none so good.

We frequently get evidence of this.

The "JOURNAL OF GAS LIGHTING" has given proof time and again of our pioneer work.

Coal screening and sorting plant is dealt with in a booklet just issued by Messrs. Head, Wrightson, and Co., of Stockton-on-Tees. It contains a large number of photographs of labour-saving machinery of this character erected by the firm for collieries, &c.

The Directors of the European Gas Company, Limited, have decided to pay on Feb. 1 the same interim dividend (10s. per share) as last year, free of income-tax. Until the accounts are made up for the financial year, it is impossible for the Directors to estimate how far the profits of the Company will be affected by the war, and what the amount of the final dividend will be.

The high-pressure gas and industrial heating laboratory of the Birmingham Corporation has been transferred from Newhall Street to the Gas Department Extension in Edmund Street. Here a special laboratory has been equipped for dealing with all matters relating to the uses of high-pressure gas and ordinary town gas for industrial heating and manufacturing purposes.

The Directors of the Humphrey Pump Company, in their report for the period from June 12, 1913, to September 30, 1914, state that the war has seriously affected the business of the Company; and the large pumping contract at Mex, Egypt, has been cancelled by the Egyptian Government. The contract for the five large pumps erected for the Metropolitan Water Board at Chingford has been successfully carried to completion. The profit and loss account shows a deficiency of £16,175.

The Wholesale Fittings Company, Limited, of No. 23, Commercial Street, E., have issued a supplementary list dealing with the latest designs offered by them in gas burners, pendants, brackets, shades, &c.

The local Parish Council have decided to utilize gas for lighting Barnes Cray, provided that the South Suburban Gas Company lay free of cost a main in every road where houses are erected. The charges quoted by the West Kent Electric Company were £3 12s. 6d., £3 2s., and £2 10s. per lamp per annum, according to candle power, and for gas £3 15s., the lamps, &c., to become the Council's property at the end of five years.

The gratifying increase of activity in many of the manufacturing industries during the past three months is well exemplified by the large number of orders now being placed in this country for water softeners and purifiers, feed-water heaters, &c.—a sure index of works extensions on a large scale. We are informed that since the outbreak of war United Water Softeners, Limited, who are makers of "Lassen-Hjort" and "Permutit" water softening and purifying plants, have entered into contracts to erect over a hundred installations, totalling several million gallons daily, for firms in the United Kingdom. The considerable extent to which such labour-saving and waste-eliminating appliances are adopted in this country is pointed to as a refutation of the oft-repeated assertion that British manufacturers are backward in utilizing scientific methods of economy in their works processes.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

DRAUGHTSMAN. Robert Dempster and Sons, Limited, Elland.
DRAUGHTSMAN. Mansfield Gas and Water Department.
MANTLE MANUFACTURER. "Mantles," c/o William Porteous and Co., Glasgow.

Plant, &c. (Second-Hand), for Sale.

CONDENSERS, WASHERS, AND SCRUBBERS. Croydon Gas Company
PURIFIERS. Millom Gas-Works.

Gas-Works Wanted.

Particulars to "PRINCIPAL," Scripps's Advertising Offices, 13, South Molton Street.

Sales of Stocks and Shares.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. London Mart. Jan. 19.
BOURNEMOUTH GAS AND WATER COMPANY. London Mart. Jan. 19.
BROADSTAIRS GAS COMPANY. London Mart. Jan. 19.
WORTHING GASLIGHT COMPANY. London Mart. Jan. 19.

Meeting.

COMMERCIAL GAS COMPANY. Cannon Street Hotel. Feb. 4. Twelve o'clock.

TENDERS FOR

Stoves and Grillers.

GLASGOW GAS DEPARTMENT. Tenders by Jan. 19.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1915 are reminded that this can only be done during the month of January.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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O'NEILL'S OXIDE
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LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
NORTON STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Lysol, Sulphate of Ammonia.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
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with which is amalgamated WM. PEARCE & SONS, LTD.,
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FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
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Supply
COMPLETE CARBONIZING PLANTS,
WASHER SCRUBBERS,
PURIFIERS,
SPIRAL OR STANDARD GUIDED GAS-HOLDERS.
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GAS LIGHTING ENGINEERS AND CONTRACTORS.
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

"Journal of Gas Lighting, Water Supply, and Sanitary Improvement."—Dec. 29, 1914.—Registered as a Newspaper.

Journal of Gas Lighting and Water Supply

Central Library JAN 15 1915 Chemical Lib.

Vol. CXXVIII. No 2694.] London, December 29, 1914. [66th Year. Price 6d.

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GAS PURIFICATION & CHEMICAL CO., Ltd.
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PARKINSON AND W. & B. COWAN, LTD.,
Parkinson Branch: LONDON AND BIRMINGHAM.
See Advertisement on p. 706.
Cowan Branch: LONDON, MANCHESTER, EDINBURGH, & SYDNEY, N.S.W.
See Advertisement on Third Page of Wrapper.

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Coal Owners,
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THE "STANDARD"
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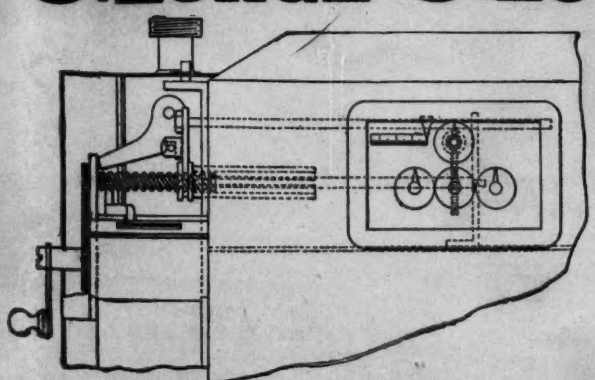
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NO SPRING in any part of the mechanism.
Can be fitted with STRONG BOX, if desired, or with "M & M" LOCK.
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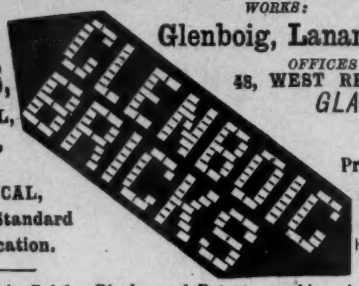

—57—
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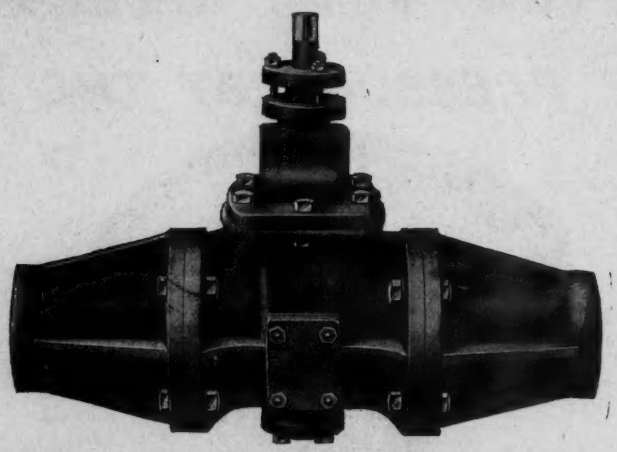

We have specially designed these valves for use in connection with high-pressure gas, either with screwed ends, flanged ends, or with separate sockets for Mannesmann Steel Tube Rigid Joint. They have all the advantages of the rack and pinion or worm and rack valve—that is to say, they have the scraping action of the doors over the faces, as the two faces are separate and kept out to their work by springs, so that they will not have the disadvantage of the usual double faced solid body type valve which tends to jamb after it has been at work some time.

Very much thought and care have been given to the design of these valves and very rigid air tests have been made upon them for tightness.

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JOURNAL OF GAS LIGHTING AND WATER SUPPLY

VOL. CXXVIII. No. 2694.] LONDON, DECEMBER 29, 1914. [66TH YEAR. PRICE 6d.

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No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.

Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, For foul or purified gas.

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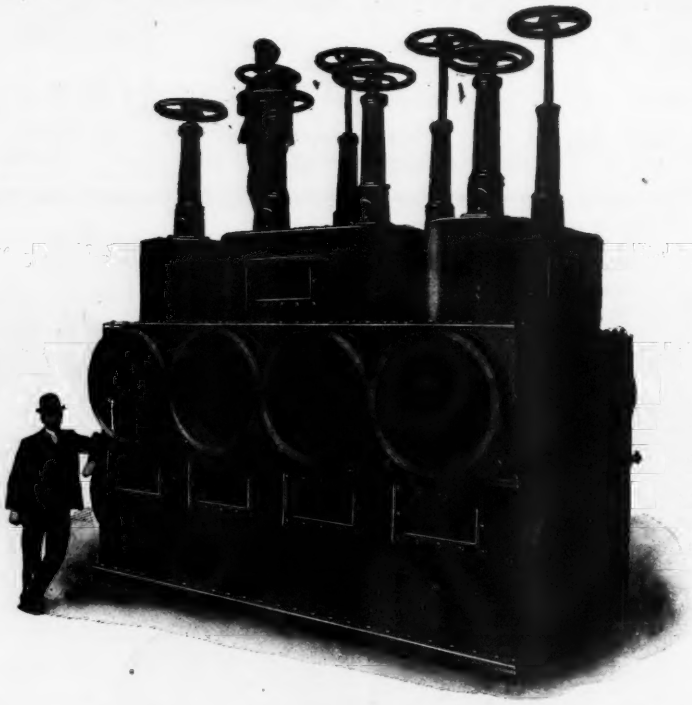

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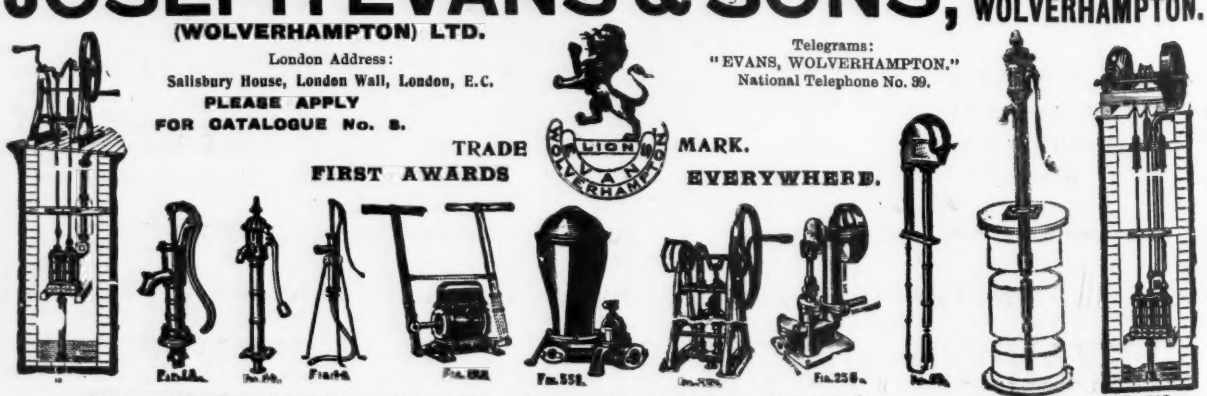

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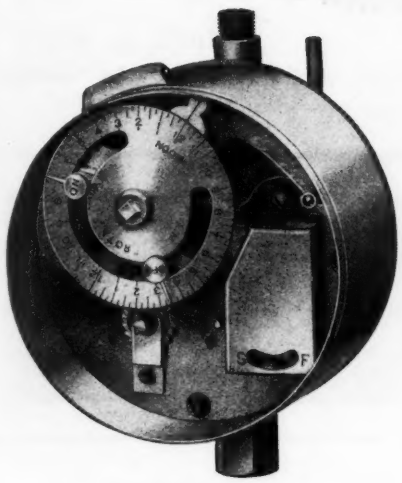
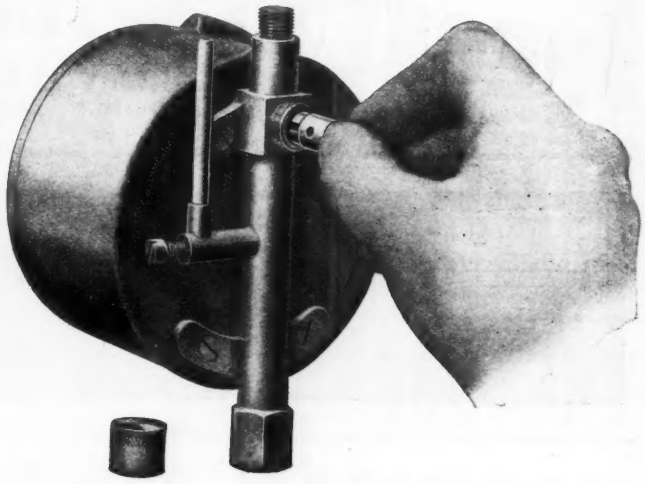


FRONT VIEW.
SHOWING ADJUSTMENT OF DIAL.



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SHOWING EASE WITH WHICH VALVE CAN BE TAKEN OUT.

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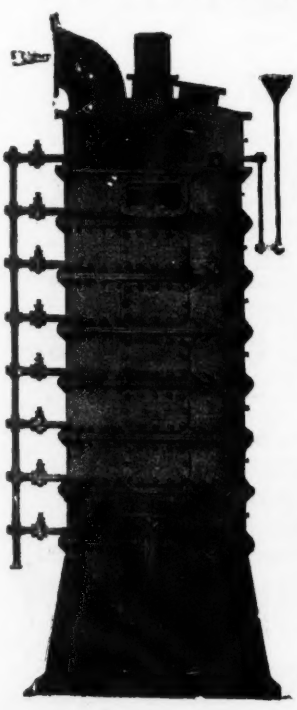
PATENT "STANDARD" CENTRIFUGAL WASHER.

For Extraction of Ammonia, Naphthalene, Benzol, Cyanide, and other Impurities from Coal and other Gases.



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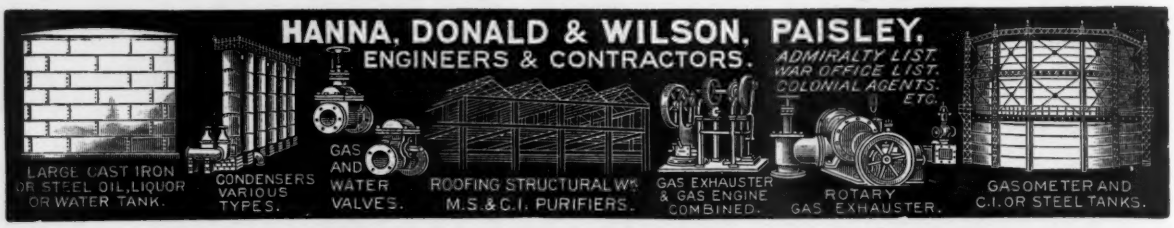
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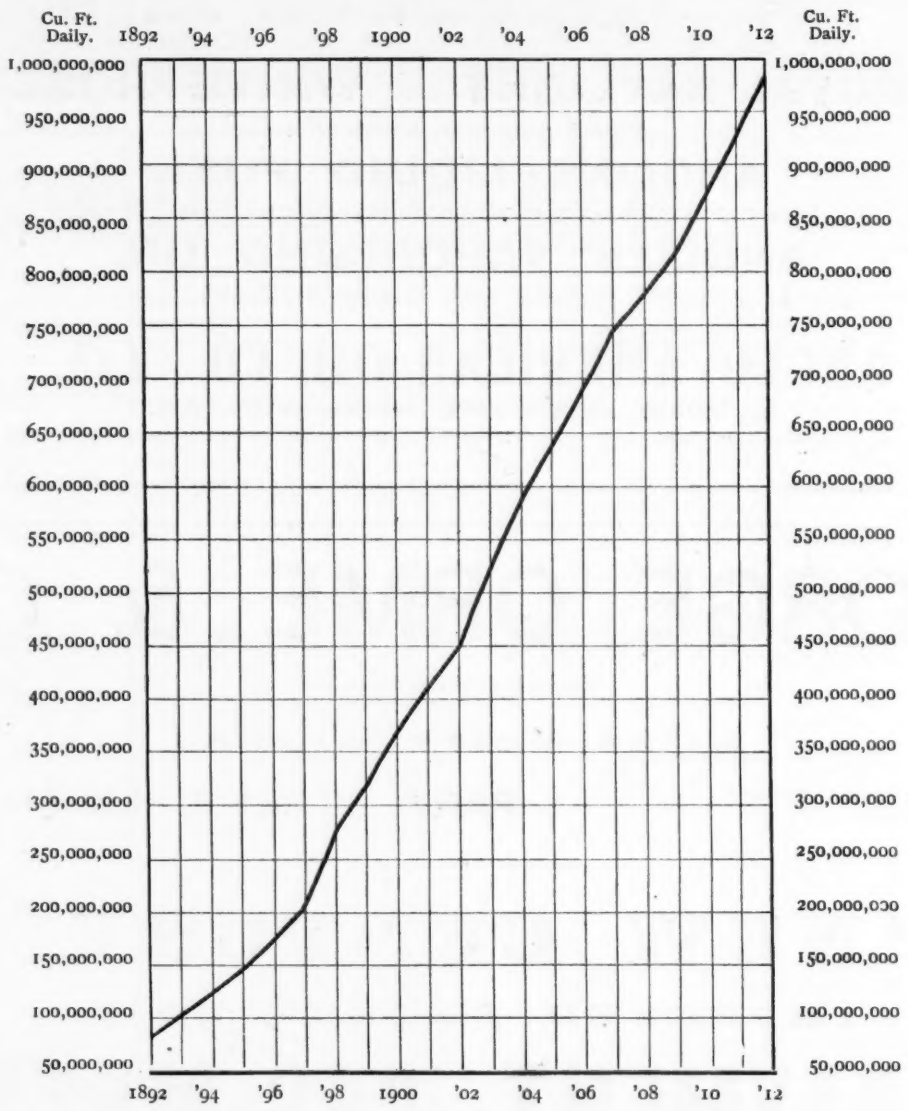

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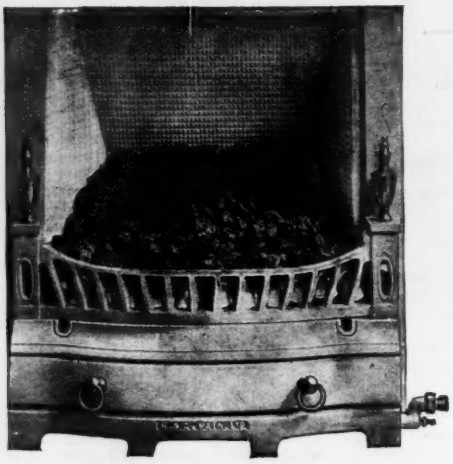

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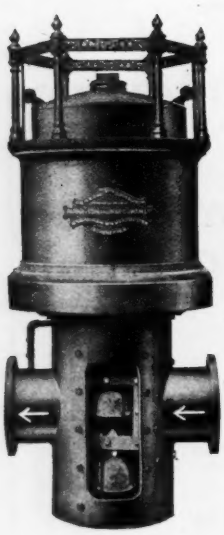

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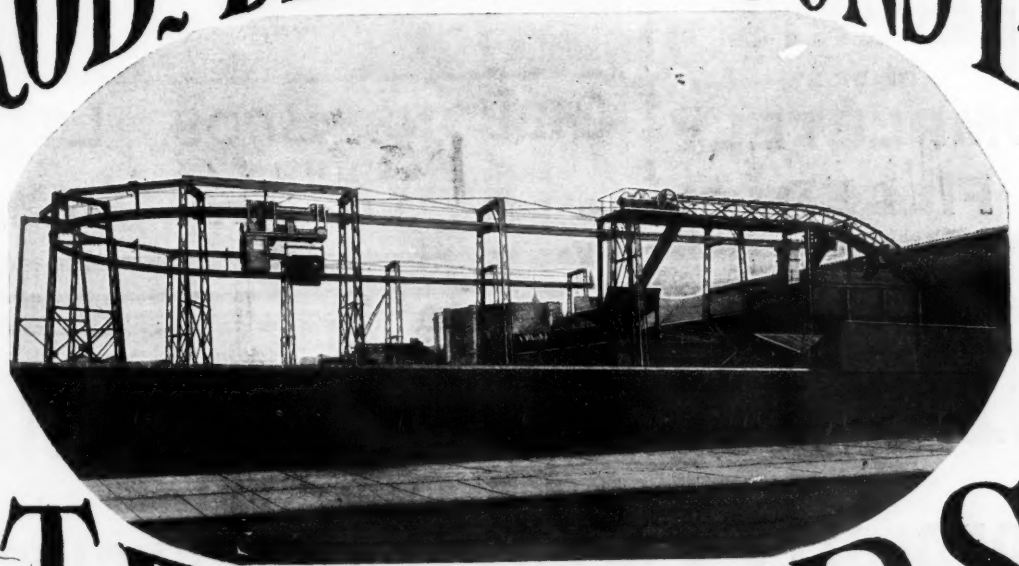

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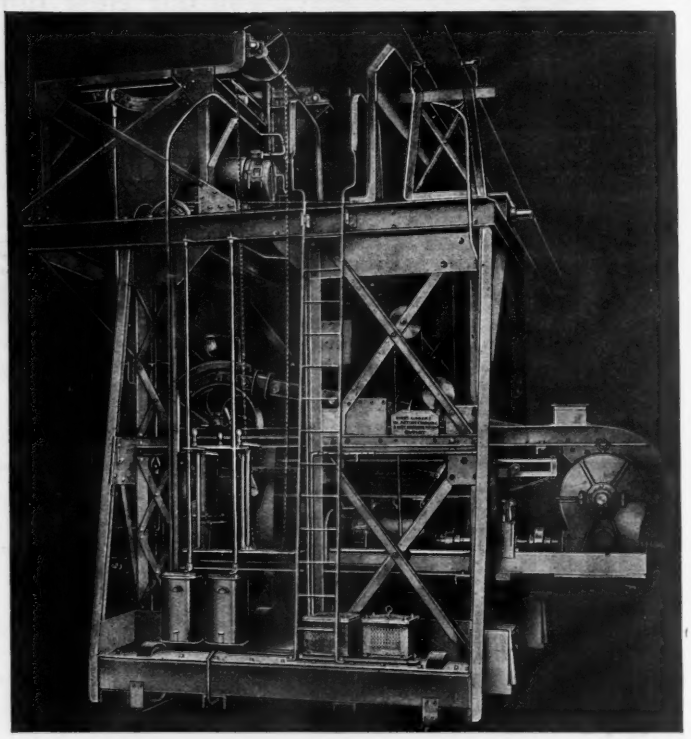

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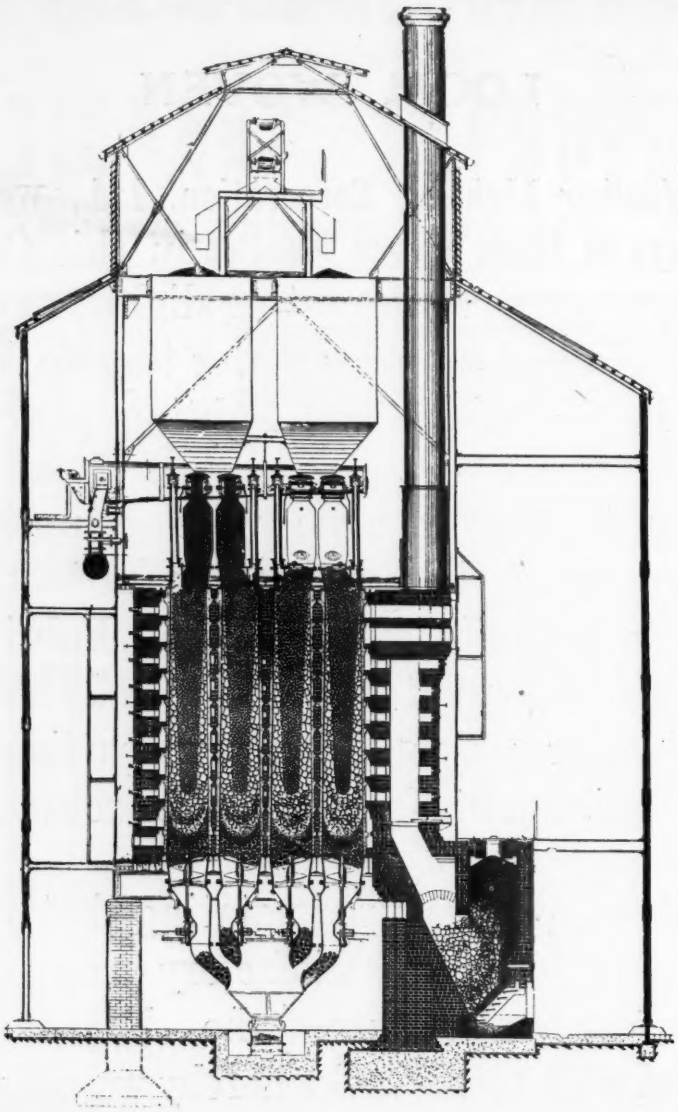

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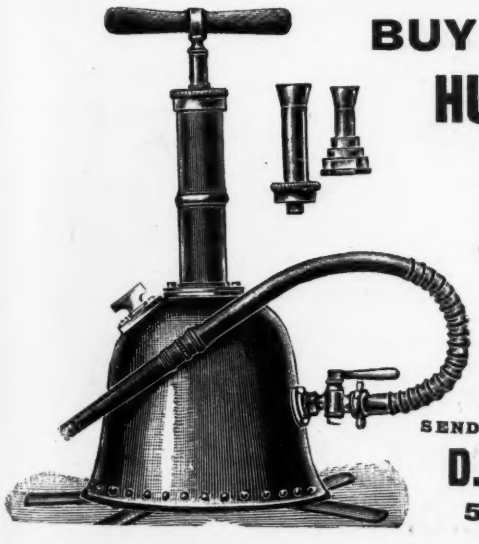

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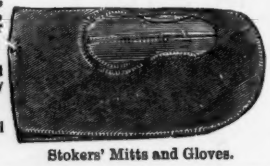

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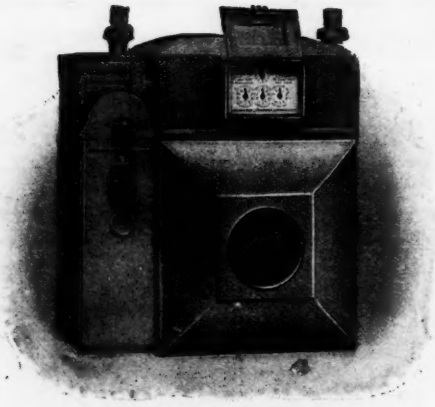

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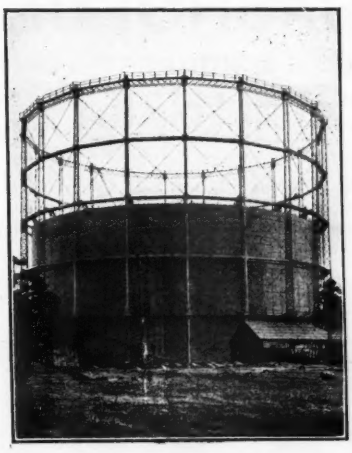

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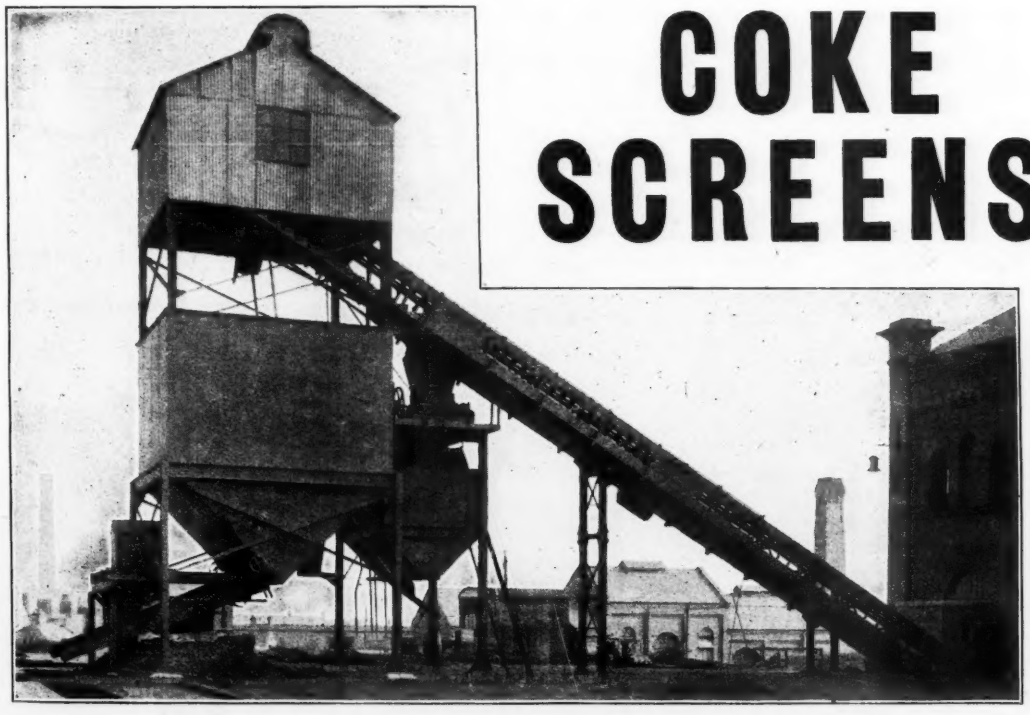

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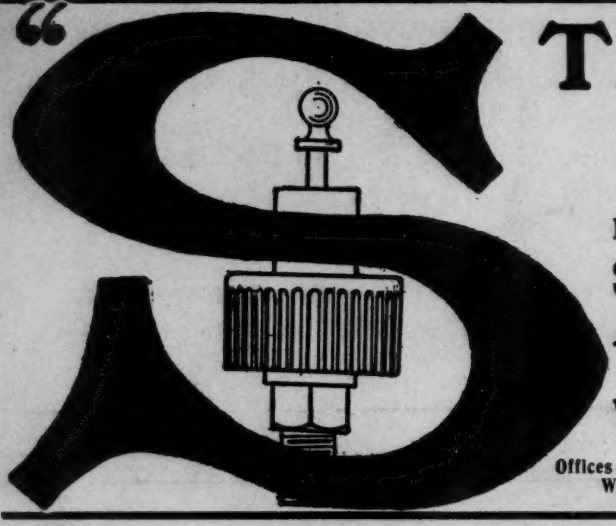

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